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SOME curious and valuable experiments have been carried out in England showing the effect of heat upon steel. A steel bar of ordinary size having been taken, six or eight inches of one end was heated to a low red heat, the heated part was nicked all round the bar at intervals of half to three-quarters of an inch, until eight or nine notches were cut. This nicking was done at red heat, to determine the fracture at the nicks. Next, the end of the bar was placed in a very hot fire and heated white hot until it scintillated at the extreme end, leaving the other parts enough out of the fire to heat them only by conduction. The end remaining in the fire until the last piece nicked was not quite red-hot, and the next to the last barely red hot. The conclusions drawn from after inspection were: First. Any difference in temperature sufficiently great to be seen by the color will cause a corresponding difference in the grain. This variation in grain will produce internal strains and cracks. Second. Any temperature so high as to open the grain so that the hardened will be coarser than the original bar will cause the hardened piece to be brittle, liable to crack and to crumble on the edges in use. Third. A temperature high enough to cause a piece to harden through, but not high enough to open the grain, will cause the piece to refine, to be stronger than the untempered bar, and to carry a tough, keen cutting edge. Fourth. A temperature which will harden and refine the corners and edges of a bar, but which will not harden the bar through, is just the right heat at which to harden taps, rose-bits, and complicated cutters of any shape, as it will harden the teeth sufficiently without risk of cracking, and will leave the mass of the tool soft and tough, so that it can yield a little to pressure to prevent the teeth tearing out. These four rules are general, and apply equally well to any quality of steel, or to any temper of steel. Steel which is so mild that it will not harden in the ordinary acceptance of the term, will show differences of grain corresponding te variations in temperature. To restore any of the first seven pieces to the original structure it was only necessary to heat it through to a good red heat, not to a high red, allow it to stay at this temperature for ten minutes to thirty minutes, according to size of the piece, and then to cool slowly. This property of restoration is not peculiar to any steel, and its performance requires no mysterious agencies beyond those given above. It should be distinctly borne in mind that a piece restored from overheating is never quite as good as it would have remained if it had never been abused, and we strongly advise that no occasion should ever be given for the use of this process of restoration except as an interesting experiment. The original and proper strength of fine steel can never be fully restored after it has once been destroyed by overheating.

IT is an amazing thing in mechanics that friction clips should have been so long used so as to bring checking strains directly on ropes, as for mine and colliery shafts, instead of confining such to the actuating machinery. On ropes subject to a heavy strain the action of the clips cannot fail to be injurious. What is above all things to be avoided, whether a brake be applied gradually or suddenly, is extreme friction or severe compression on the rope. An invention has recently been patented which appears to comply with the proper conditions. A brake is fixed, not on the rope itself, but on mechanism connected with V-pulleys, round which the rope is twined forming a figure of 8. The friction on the pulleys is so great, by reason of the turn round each pulley given to the rope, that no appreciable relative motion can take place between the two. As the brake, however, is applied on the axles of the pulleys, or rather on brake wheels on these or on one of the axles, whatever friction is expended on stopping the rope is spent on the brake block or the belt and brake wheel, and not on the rope. Upon the overhanging ends of two shafts having bearings in a stout frame four pulleys are placed, two on each shaft, connected by spur gearing. On the other ends of the shafts are placed two brake wheels with a single brake strap, so arranged that a man by means of a lever can put a sufficiently powerful strain on the brake strap, so as to give the brake the requisite power. Upon one of the shafts is a worm wheel, or first wheel of other train of gearing, and a clutch, so arranged that the gearing can be connected with the shaft at a moment's notice. The rope is passed from a reel through a guiding eye on to one of the other pulleys, around which it passes. It is then wound around the other outer pulley in the opposite direction, then around the opposite inner pulley, the direction being the same as in the first instance, and finally around the remaining pulley in the same direction as round the second pulley. The brake can be applied gradually or suddenly. By putting the clutch into gear the apparatus becomes a winch, and, the brake being thrown out of action, the rope hauled in. In lowering heavy weights the brake can be applied, the clutch thrown out of gear and the descent regulated with the greatest nicety by hand-pressure on the brake lever. The apparatus does not, of course, prevent the tensile strain on the rope arising from the sudden checking of a heavy weight being lowered, but with this exception the tensile strain is no more severe when applied than at other times.

THE increased cost of building materials and building labor has materially reduced the proportions which building operations would otherwise have assumed in Cleveland and other cities. So far as this cause checks the building of tenement houses it is to be regretted. In few localities, certainly not here, can the full demand for them be met, this demand arising partly from additions to population, and partly from the additional means for superior accommodation which the activity of our industries provides. Mechanics will be no losers by any projected building schemes not being carried out, for it is evident that they find abundant work. Among the enterprises abandoned in various quarters are large and costly edifices, such as opera houses, town halls, &c. It does not appear that the erection of these will be more than postponed; present abandonment is simply occasioned by original estimates of cost being far exceeded. This increase of cost falls particularly heavy on manufacturers who are compelled to erect new works or enlarge existing ones. Whilst the rates in Cleveland are lower for bricklayers, they are considerably higher for carpenters and masons. The same is true of Cincinnati, Dayton, Columbus and Toledo. Owing to the prosperous state of the country there will, on the whole, be probably more building this year than last.

A RAILWAY financial transaction of great importance to the Erie, as securing to that company an outlet to Cincinnati and the Southwest, was effected last Saturday. This was the securance of the control of a majority of the stock of the Cincinnati, Hamilton & Dayton Railroad Company by Hugh J. Jewett, in the interest of the New York, Lake Erie & Western Railroad Company, of which he is President. The price paid was par, and the stock was bought from a pool which has been in existence two months. This new outlet for the Erie is of the greater importance that in about a year the Southern railroad system controlled by the Erlanger syndicate will be completed, and a direct line will then be open from Cincinnati to New Orleans. Mr. Jewett's purchase grew out of the steps taken by W. H. Vanderbilt last year to embarrass the connections of the Erie road with the West and Southwest. The Vanderbilt western roads were shut to the Erie's fast freight lines, and Mr. Vanderbilt subsequently secured the control ot the Cleveland, Columbus, Cincinnati & Indianapolis. With the last-named road in hostile hands, the Erie was prevented from reaching Cleveland and Indianapolis. The Cincinnati, Hamilton & Dayton runs from Dayton to Cincinnati, O., about sixty miles. The Erie reached the latter city by its connection over its ally, the New York, Pennsylvania & Ohio Railroad, from Salamanca to Dayton, and thence over the Hamilton & Dayton Road. The Dayton road heretofore has been controlled by the Cleveland, Columbus, Cincinnati & Indianapolis Company, which owns one block of 9,200 shares of the former corporation. Mr. Vanderbilt attempted to consolidate the two lines under the name of the Ohio Railway Company. The Ohio courts decided against the legality of the consolidation. About the middle of last February, prior to the decision, which, however, had been expected to be adverse to the Vanderbilt interest, the outside stockholders of the Cincinnati, Hamilton & Dayton Railroad pooled their stock for purposes of self-protection. Eventually more than a majority of the $3,500,000 capital stock of the company was placed in the pool. On March 30, the pool stockholders authorized the sale of their stock in one block, at par, and a willing purchaser was found in Mr. Jewett. It is said by Erie people that the Cincinnati, Hamilton & Dayton Road will not be managed hostilely to Mr. Vanderbilt, provided a proper understanding can be reached with him. Mr. Jewett's purchase, they say, was not dictated by any aggressive spirit, but only by a desire to protect the Erie's outlet to the Southwest.

THE meeting of the Committee appointed by the Amalgamated Association of Ironworkers and the committee of manufacturers at Pittsburgh with reference to the scale of wages to be established in June, in various departments, proved to be merely of a tentative character, a postponement being effected to the latter part of this month. The conference elicited the fact that one ground on which a claim for advance is based is that manufacturers have been engaging more extensively in specialties, such as cold steel shafting, nuts, &c., on which their profits are larger than on other

products. The manufacturers, on their part, did not admit that profits were such as to justify an advance and pointed out that when the agreement was come to last year it was on the condition that no advance should be asked the present year.

THE Master Car-Builders' Association, which, by the way, is about reorganizing, with a view to increase its usefulness, dwells, in a circular it has issued, on the advantage of greater uniformity in the gauge of articles entering into railway cars. Besides allowing parts to be more readily duplicated, uniformity would save railway companies the necessity of keeping on hand so complex a stock as at present. It appears that one Eastern road has to have on hand 40 different kinds of brake-heads and shoes, 11 different journal-boxes, 37 journal-bearings, 10 cast iron and 5 or 6 wrought-iron draw-bars, 8 or 10 different draw-bar side castings, and a number of various other kinds of different parts to cars. The Baltimore & Ohio Railroad supplies a remarkable list, of which the following may serve as a sample: 65 different kinds of journal-bearings; 25 different kinds of journal-boxes; 25 different kinds of journal-box covers; 20 different kinds of brake-shoes; 22 different kinds of brake-heads; 12 different kinds of brake-hammers; 6 different kinds of axles; 8 different kinds of draw-bars; 10 different kinds of draw-bars, follower-plates; 15 different kinds of draw-bars, spring-plates; 8 different kinds of draw-bars, stop-castings; 10 different kinds of side-bearings. There is great cost and much loss of time in keeping ready to call these dead supplies. It is forcibly pointed out that if there was greater uniformity, the result would be that many parts of cars would become staple articles of merchandise. They could and would be manufactured in large quantities by those who could produce them at the lowest cost. In dull times manufacturing establishments could be employed in making such articles without orders, with the assurance that ultimately there would be a market for them. In this way the supply and prices would be equalized and the latter reduced, and the tendency would be to accumulate stocks of such articles. adequate to meet the demand at any time. The general adoption of the Master Car-Builders' standard axle has, in fact, already been followed by such results, and axle manufacturers now do not hesitate to make large numbers of them without orders, whereas they are not safe in making axles of special sizes, which are used only by one or very few companies. There is no reason why standard journal-bearers, journal-boxes, journal-box covers, pedestals, dust-guards, brake-shoes, brake-wheels, draw bars, draw-springs, coupling-pins and links, and, in fact, all the forgings and castings used about cars, should not become just as much staple articles as bar and angle iron, bolts, nuts, screws and rivets now are.

A TABLE of the growth of the States in population, in the past ten years, made up by Mr. Deering of Iowa, discloses the small growth of most of the New England States and some of the Middle States, as compared with the South. The ratio of growth among the original thirteen States was greater in the South than in the Centre or the North, from 1870 to 1880; while, taking together all the former slave States, only the West and Northwest, with their vast European immigration, can compare with the gains of the South during this decade. One astonishing feature is the enormous growth of Texas, surpassing the gains of population of even the most populous States, being, for example, almost a quarter of a million greater than that of Ohio. The growth of Kansas, which now stands fourth in the list, is equally amazing. Illinois has for the first time surpassed Ohio in absolute gains. Colorado takes the lead of all the States in the amount of per centage gain.

AN examination of the commercial failures in the United States in the first quarter of the present year shows that the Middle States have far exceeded the Eastern States both in number of failures and amount of liabilities. Whilst in the Eastern States there were 292 failures for $2,112,876, the Middle States had 508 failures, with liabilities of $10,608,612. In each geographical division there were more failures, attended with greater liabilities, than in the corresponding period of 1881. The Southern States had the greatest number of failures of the leading geographical divisions, the amount of liabilities being almost double those of 1881, or $11,087,250 in the three months as compared with the corresponding period of last year. The Pacific States and Territories came off lightly. The total number of failures throughout the United States in the first three months of this year was 2,190, and the amount of liabilities $30,338,271, or $6,000,000 in excess of the same period of 1881.

THE bill amending the patent laws, now before the Committee of Patents of the House of Representatives, provides among other things that all patents for inventions first patented in a foreign country, which have not expired at the date of the passage of this Act, shall remain in force for the term of seventeen years. This is objectionable, as it would extend foreign patents now subject to expiry before seventeen years. Why should the manufacturing interests be called upon to give this boon to their own disadvantage?

MANUFACTURES.

TO MACHINISTS, MANUFACTURERS AND OTHERS.

THE publishers of THE TRADE REVIEW solicit items of information concerning manufacturing and other establishments in any part of the country, and all such items will be promptly inserted in these columns, free of charge. Facts are the only things needed; and all communications should be accompanied with the name of the contributor—not for publication—but as a guarantee of good faith.

Manufacturers, machinist and engineers are particularly requested to communicate any matters of interest relating to their specialties. No one need be deterred from sending any interesting facts in his own language, as all such contributions will be properly revised befer sendin to press.

OHIO INDUSTRIES.

EIGHT of the new nail machines for Belfont are in place.

THERE is a prospect of Norwalk having glass works and a rolling mill.

THE miners at Mineral Ridge are all out because of a 10 cent reduction.

THE Shelby Mill Company has been organized with a capital stock of $75,000.

THE final location at Norwalk of the Wheeling & Lake Erie shops has given great satisfaction to its citizens.

Two new puddling furnaces have been put up at Belfont; several more will be erected during the summer.

THE Sarah furnace, Ironton, was blown out this week. It is to have a new lining and be thoroughly overhauled.

THE coal miners of the Mahoning Valley have given notice of a strike on the 24th inst. should the reduction in their wages of 10 cents per ton not be cancelled.

THE Lake Shore Rolling Mill was closed on Wednesday by the Cleveland Rolling Mill Company, owing to a demand for higher wages by the men, some 50 in number.

THE Hofer Brothers, formerly of Hannibal, have bought the Woods flour and woolen mills at Powhattan, and are preparing to do first-class work. They will remodel and almost rebuild the entire concern, put in new machinery, and expect to do a good business.

THE work of converting the old Swartz factory at Martin's Ferry into a suitable factory for the New Union Glass Co. is proceeding.

MR. ED. H. VIERS has bought the old mill lot known as Clark's Mill, Loyal Oak, and it is reported proposes to build a steam grist mill on the old site.

THE Jefferson Iron Works, Steubenville, have contracted with the Centre Foundry and Machine Company, of Wheeling, for four additional nail machines, which will increase their plant to 102 machines.

MESSRS. Losier & Levi, the parties who recently purchased the large property at Cuyahoga Falls, seem to be pushing things in good earnest. The older portions of the building have been torn down and will be replaced by new timbers. A new furnace, also, will be built.—*Beacon.*

THE new stove foundry at Martin's Ferry will be 100 feet long and 55 feet wide; the wareroom will be 82 feet long, 36 feet wide and three stories high; the engine room and cleaning-room 45 feet long and 30 feet wide. The capital stock of the company is $30,000.

THE Tenth Cincinnati Industrial Exposition will open September 5th, and close October 7th. There will be no charges for space or steam power. Special arrangements have been made for transportation of exhibits.

MESSRS. STOEHR, KEECH & Co., of Pittsburgh, will commence next week the erection of a glassware table manufactory at Massillon. The inducements offered by its citizens are one and a half acres of land and $6,000. The works will be situated near the rolling mill.

THE work of erecting the McDonald shield at the puddling and heating furnaces of Brown, Bonnell & Co., Youngstown, is going forwrrd and will soon be supplied them. They will add much to the comfort of the employes by preventing the heat from the furnaces striking them. Several other mills there have in contemplation the securing of the shields for their furnaces.

THE Tipp Paper Company, Tippecanoe City, has contracted with Messrs. Black & Clawson, of Hamilton, for a double-cylinder, 72-inches paper machine, with nineteen dryer, to be completed early in August. It is for the manufacture of straw boards, and will be the largest paper machine ever built in the West. Messrs. Black & Clawson are negotiating to build machines for several Eastern mills.

THE buildings of Mr. E. F. Pflueger's new Enterprise Works in the southern part of Akron are ready, and he is now receiving his machinery, so as to begin without delay the manufacture of patent drip and catch basins and luminous head lights, for use upon horses' foreheads so as to prevent accidents when driving after dark. The latter article will soon be ready to put upon the market.—*Beacon.*

DELEGATES representing Ohio and Western Pennsylvania coal miners opened a secret convention on Wednesday last which extended to Saturday. The result has not transpired, but we understand that a resolution was passed in favor of equalising wages in the Ohio coal regions; also in favor of making a demand for the payment hereafter of the wages reduced by Ohio coal operators on the 1st of February last, which if not conceded no more coal is to be mined after April 24th. Before the reduction the wages paid in the Hocking, Tuscarawas and Mahoning Valleys were 83½ cents per ton.

CHAFER, BECKER & DOUGHTY, practical steam and gas fitters, 8 Champlain street, Cleveland, have issued a circular to the trade stating that Mr. John Becker, formerly with Worswick Manufacturing Co., having purchased an interest in the concern, and the 0rm of Chafer & Doughty having been consequently dissolved, they will be succeeded by Chafer, Becker & Doughty. They are prepared to cut and thread all sizes of pipe, from 10 inches down, having lately put in new and improved machinery for that purpose. Having only experienced workmen, they are thus enabled to do steam and gas fitting, and all classes of pipe work, promptly and satisfactorily

SHOULD a pooling arrangement, as is reported, have been made between the Columbus, Hocking Valley & Toledo and the Ohio Central Railroads,

by which the cutting of rates on coal will cease the control of the Hocking Valley is secured to the Standard Coal and Iron Company. This, says the *Beacon*, would insure the ratification of the bar gain for the transfer of the Akron Iron Co.'s furnace and coal and iron lands at Buchtel to the Standard Coal and Iron Co., and in that case Miller & Buchtell's new malleable iron works at the crossing of Main street by the N. Y., P. & O. and C., A. & C. Railroads, will be a sure and big thing.

MASSACHUSETTS.

THE Glasgow Company at Holyoke have sent off 10,000 samples of their fine line of ginghams to all parts of the United States.

THE making of fishermen's nets is performed in large factories owned by corporations, of which there are seven or eight in the United States, employing a very great number of girls. A company at Gloucester, is now engaged in perfecting a machine capable of producing their goods more expeditiously than has been done heretofore.

A COMPARATIVELY new industry, that of copper spinning, has been introduced in Lawrence, Mass. As is well known, the old and familiar way of manufacturing vessels of copper and zinc has been by hammer, rivets and the soldering iron. A circular piece of sheet copper of ordinary thickness is placed on a lathe, and in a twinkling without the use of hammers, shears, rivets or soldering iron, is spun into the shape of a kettle, without a break or weakening of a single fibre of the material. There are no jointures, the kettle being formed entirely from the original circular copper sheet. The kettle breasts, sides, and a strengthening portion for the spout are formed of one piece of sheet copper metal and double-seamed to the pit, so that the seam is under the sides of the kettle and forms a strengthening rib upon which it rests when in the stove. Ladles and other utensils in copper and zinc, cuspadores, etc., are formed in the same manner. When the kettle is spun from the lathe into shape, it is taken to the tinning room, where the interior is tinned. It afterwards goes to the buf fing room and is polished, and thence to the plating room, where any desired plating is given. The works at Lawrence are the only kind this side of Connecticut, and are overrun with orders.—*Boston Commercial Bulletin.*

NEW YORK.

A SYNDICATE of Philadelphia capitalists have purchased the Firmenich sugar refiner property at Buffalo for $500,000.

ILLINOIS.

THE Pelletier Pavement Company, lately incorporated in Chicago, with a capital of $5,000,000, for the purpose of manufacturing paving blocks, are making preparations to commence operations on a large scale in one of the suburbs adjacent to the city. The blocks to be manufactured by this company will be made by combining a low grade of iron ore or slag with hard, durable stone, crushed to the proper degree of fineness, when the combined mass is infused with a chemical combination of oxide and chloride of iron, whose action is to solidify the mass and form a perpetual binder, never rotting or disintegrating. These blocks are said to combine the good qualities of stone, iron and wood.—*Industrial World.*

VERMONT.

THE experienced slate-workers are becoming so scarce that the Sea Green Association is about to send to Wales in the spring for 250 more men. Vermont slate is the only slate in the country having a variety of colors. All other productions are uniformly black, while Vermont has green, purple, red, variegated and a number of intermediate colors. The various uses of slate are multiplying every year. A few years ago one of the slate mills began the manufacture of slate building stone, and now one mill is kept entire on the manufacture of this article. Slate is also made into paint, and is also ground up to be used as a fertilizer. But the largest amount that goes through the mills comes out as billiard beds, it being a conceded fact that slate billiard beds are the best that can be made. About 2,500 men are employed in the mills and quarries about Poultney, and 500 more will probably be added this spring, who, with the other helpers, will bring the number up to 3,500 or 4,000 men. There were shipped from the quarries last year more than 150,000 squares of roofing slate, which, at an average price of $3.50 per square, would amount to $525,000. The productions from the mills would run up the amount to millions of dollars.

NEW YORK INDUSTRIES.

[FROM OUR SPECIAL TRAVELING CORRESPONDENT.]

BUFFALO, N. Y., April 20.

In most of the manufacturing establishments of this city business is encouragingly brisk.——Mr. David Bell, builder of iron ships, iron and steam yachts, engines and boilers, and improved propeller wheels, and who makes steam hammers a specialty, employs 100 hands. Business reported very good. He is executing quite a number of large orders. He he has very nearly completed an iron propeller 110 feet long, 22 foot width, depth 9 feet, for the New York and Lake Champlain Transportation Company. Mr. Bell builds the engine and boat complete, and expects to have her ready for launching about the first of May. He built the first iron mer chant steamer that ever run on the lakes. This was in 1862, the steamer being the Merchant, of 893 tons, and which was immediately put on the Buffalo, Detroit and Chicago trade. This was the first iron vessel built here. Her cost was $90,000. In 1872 she was lengthened at the expense of $30,000, and until 1875 was, so far as her iron work was concerned, practically as good as new. The latter part of 1875 she struck the Racine reef, and filling went to the bottom, where she still lies. From 1872 to 1875 she sunk three times from collisions with rocks and shoals in darkness and fog but was each time readily raised. Mr. Bell, in former days, did much to mould marine opinion in favor of iron vessels. This is a confessedly great honor, and all the greater that he developed the practicability of iron as a material for vessel hulls.

One of the sights of Buffalo is the Howard Iron Works, an enormous building, in which 250 hands are at work. Here are manufactured Schlenker's stationary-die and revolving-die bolt cutters, Howard's parallel bench vises, hydraulic, power and hand elevators, and book-binders' machinery. The works have been in operation 35 years. Trade is good. Among specialties are bark mills, tannery fixtures, railroad supplies, castings, &c.——The De Laney Forge & Iron Co., established in 1850, and who manufacture light and heavy forgings, axies and hammered shapes of every description, are in a most prosperous condition Their vast works constitute a prominent feature of the manufacturing portion of this thriving city.——John T. Noye & Sons, manufacturers of millstones and machinery, smooth and corrugated rolls, have driven a large business since the date of the commencement of their operations in 1834. They ship all over the Union, and although they have 325 hands, have their facilities taxed to the utmost to cope with orders.——E. & B. Holmes, 59 Chicago street, also corner of Michigan street and the canal, inventors and manufacturers of stave, barrel, keg and hogshead machinery, established in 1853, employ in their vast establishment 325 hands. No less than ten teams are required to do their hauling. Shipments are made all over the Union. They have heavy orders on their books for their barrel machinery for Germany, England and Norway. Quite a large trade has of late been carried on by them in the Southern States, and they speak very encouragingly of their prospects of trade in that direction for the future. Their monthly pay roll amounts on an average to $12,000.——The King Iron Works, which have achieved an extensive reputation for their engines, afford constant employment to ninety hands. These works have been in constant operation for forty years. I found ready to be placed in an iron boat a large engine, the lower cylinders of which are 32x48. The pro prietary are turning out some admirably effective compound engines.——Robert Dunbar & Son, of the Eagle Iron Works, corner of Perry and Mississippi streets, builders of steam engines and machinery, and who make a specialty of shafting, gearing for derricks and hoisting machines, employ one hundred hands. They are now building for the connecting terminal of the railroad companies in Buffalo two grain elevators of large capacity.

Frank & Co., corner of Terrace and Charles streets, have been engaged in the manufacture of wood-working machinery for twenty-seven years, having previously had an extensive practice in its use. They carry on the business from designing and making the patterns and castings to finishing the machines, testing and operating them. They use the best quality of iron—made principally from Lake Superior ores. Some of these patterns for heavy planers weigh from 3,000 to 6,000 pounds.——Bingham & Morgan, Church street, corner Jackson, manufacturers of railroad and general castings, have had their establishment in operation for 33 years, and are fully occupied. Fifty hands are employed at their foundry.——The Dempster Engine Works, 36, 38 and 40 Washington street, employ thirty hands. They have ready for shipment a 100 ton horse power engine for Rochester parties, and have orders on their books for St. Louis & Chicago. Their trade in second-hand machinery is excellent.——The Empire State Manufacturing Company, formerly the Washburn Manufacturing Company, Washington, corner of Ohio street, nickle platers and polishers, manufacturers of hand-fluters, hardware specialties, and patent spun full copper and half copper tea kettles, have twenty hands employed. The business is widespread, and continues prosperous. Shipments are made all over the Union. The increase, so far this month, is one-third more than in the corresponding period of last year. O. F. Swift is proprietor. ——Pratt & Letchworth, proprietors of the Buffalo Malleable Iron Works and Buffalo Steel Foundry, manufacture on a large scale hames, saddlery and carriage hardware. The excellence of their workmanship assures them an enlarging business.

Mr. Paul Sand, 70 and 72 Columbia street, who manufactures his own improved patented drilling machine, makes shipments principally West. Having personally inspected the machine, a description will be of interest to your mechanical readers: The machine, which is simple and durable, will drill 1½ down to 1-32 inch holes. The column is 6 feet long, diameter 5½ and 4¾ inches. The feed motion is a screw with two threads to the inch, and works very perfect and quick. The bearings are all large, all having caps, in order to take up any lost motion. The Pwal rachet for raising or lowering the two arms is a new improvement. The table arm turns around the column, and will drill to 28 inches. Mr. Sand has several large orders on hand for his drill.——Whitmore & Shoemaker, manufacturers of improved drill presses, emery lathes, and key seal milling machines, who have been in business five years, are making shipments to New York, Philadelphia, Chicago, St. Louis, Cleveland and Pittsburgh. The firm employs twelve hands. ——The Wilson Chemical Fire Extinguisher Company, 12 Perry street, manufacturers of fire extinguishers, chemical engines and stationary tanks, report trade very good, and look for a very busy season.——Machwirth Bros., 92 and 94 Broadway, copper, tin and sheet iron workers, keep busy, on an average, 60 hands. The present firm has been established three years, but Mr. A. Machwirth commenced the business 40 years since. Shipments are made through New York and the oil regions. The firm are dealers, in stoves, nails, tin and hardware, and house furnishing goods.——The Contractors' Plant Manufacturing Company, manufacturers of Dobbie's derrick power and boom hoister, and contractors' supplies, 296 Exchange street, have lately commenced business here. They report trade fair, and prospects for the coming season good. They ship all over the country.

Mr. F. H. C. Mey, 18 to 24 Columbia st., builder of grain dryers, etc., also manufacturer of elevator buckets and chain belting for elevating, conveying and drawing purposes, has been in business since 1876, and reports trade good. His machinery is of the most improved style. He has in the last year built a very nice shop; but the increase of trade is such that he feels compelled to enlarge his establishment. His belting will neither stretch nor slip, nor be injured by exposure to moist substances, heat or steam, so that it is especially useful for elevating or conveying grain, wet or dry; the buckets are very strong and durable, whilst Mey's Elevator has an advantage appreciated by the malster, that of giving him an opportunity and free access to clean out the receiver when ready for elevating malt.——Whitmore & Shoemaker, 292 Exchange street, manufacturers, of F. A. Shoemaker's improved upright drill press, certainly furnish one of the most perfect, durable, and complete tools of the kind. This drill is made from entirely new designs, having a large and substantial base, well slotted for bolting on large work, raising and lowering side swing arm and revolving table; also a heavy straight column and countershaft attached, with a four speed cone to accommodate extra wide belt. The drill is back-geared, gear being firmly supported on back of column in a long slide bearing, and is thrown in and out by means of a lever with a spring catch, lever acting on slide which supports the gear stud, each machine having extra heavy gears, all of which are

machine cut, giving smooth, even, and noiseless motion to the drill.——L. & I. J. White, 312 Exchange street, wholesale manufacturers of coopers' tools, carpenters' tools, draw shaves, cleavers, choppers, ship tools, chopping axes, and machine cutters, were established in 1837. Thev have a constant inflow of orders, and employ 45 hands.

The Industrial Tool Works, Effner and Georgia streets, employ 35 hands. Business was commenced in 1837. Their orders come from all over the country, and enough are on their books to keep them busy till next July.——Mr. George H. Kerr, general jobber and repairer, has an excellent business. He also deals in second-hand machinery. ——The Western Wood Engraving Company, central office, Bapst Block, corner Washington and Seneca streets, the members of which are Messrs. Worcester & Braun (successors to Joseph Schenk), execute a wide range of work, including every description of wood engraving. The superior character of their work has obtained wide recognition. They make mechanical and catalogue work a specialty. They also carry on electrotyping and stereotyping.——Messrs. Hardwick & Ware, whose specialties are oil well and refining supplies, commenced business here in 1845, and employ 20 hands. Their shipments are principally in New York State and the oil regions.

Curiosities of the Metal Trade.

It is a pet theory of many workers in copper that this useful metal is eventually destined to become as cheap as lead or iron, because of the extent to which the world's supply is constantly being increased through the preservation and re-utilization of old copper and brass. The only copper which is actually consumed is that which is dissolved into dust, or lost in the sea, or buried in the land beyond hope of recovery. A ship which should be given a new suit of copper or yellow-metal sheathing this week, would probably offer a large portion of it for sale three years hence as old metal. Mill accoutrements, hose couplings, lamp burners, faucets, and the thousand and one articles in the manufacture of which copper is "consumed," nearly all come back into the market again sooner or later. The City of Boston gives an order for hose couplings to-day, and in the course of a few years it will offer the same couplings for sale as old metal. The 500,000,000 bushels of wheat raised in the United States per annum is nearly all consumed each year; but the 70,000,000 pounds of copper, which is now estimated as the annual production of this country, is merely added to the vast supply of copper and brass that has been accumulating in the world since the days of Tubal Cain. Some of the copper now in use on the steam fire engines of this city may, in fact, have been originally worked by old Tubal himself, in the days when the earth was young. A leading metal dealer in this city was once offered a sample barrel of little articles which looked like homœopathic pills. Upon examination the pellets were found to consist of small globules of paper covered on one side with brass and on the other with tinned iron; and the dealer was informed that the sample represented some fifty tons of such stuff that was accumulated every year. It subsequently transpired that what seemed to be brass and sheet-iron pills were really the little refuse pieces which were cut out by machinery in the process of making the thread-holes in brass buttons for men's pantaloons. Imagine the quantities of brass buttons which must be produced by a concern that cuts fifty tons of waste material per annum out of thread holes alone! On another occasion a metal dealer bought some pins without knowing exactly how many he was to receive, and was surprised to find awaiting his order at the railroad depot four or five casks, each of which contained about a ton of bright new loose pins, such as are generally sold by the paper. A portion of the pins were bent, but all of them were new. Being desirous of learning why such a large quantity of pins was thus sold for old metal, the buyer was informed that they came from a straw shop in a Massachusetts town, where large quantities of pins are used by the operatives in holding the hats together previous to stitching. Occasionally an operative dropped a pin, and as it was not worth while to get down and pick it up, quite a little accumulation of such pins was gathered up each day when the floors were swept.—*Boston Com. Bulletin.*

"BLUE GRASS ROUTE OF OHIO."—The Cleveland, Akron and Columbus Railroad.

MECHANICAL RECEIPTS AND ITEMS.

Tinning Plates.

The operation of tinning plates is as follows: Each plate is lifted singly from the grease pot, and stood on edge in the tin pot and allowed to remain immersed in the hot tin for about twenty minutes. (The tin pot is always kept nearly full of plates.) When lifted out the plate is allowed to drain for a moment, and is then changed to the first division of the wash pot for a few minutes, on leaving which it is brushed with hemp, dipped in the second division of the pot, and allowed to drain for a few minutes in the pan. The thick edge or list is removed by momentarily dipping it (the edge) in the hot tin contained in the list pot and jarring the plate. After this the plate is returned to the grease pot for a few minutes, from which it is drawn out between rollers which smooth and straighten the plates. They are finally cleaned by rubbing them with shorts or bran and leather, sorted and boxed —each box of I. C. plate containing 112 pounds or 112 plates, the plates having a gauge of No. 30, and weighing one pound each. I. X. brand weighs 140 pounds to 112 sheets. In the trade the grade, weights, and sizes of the plates are indicated by certain marks. The use of ingot steel, or very mild steel, for making tin plates, is now an established thing, and manufacturers are now taking this metal for making large tinned sheets up to seven feet by three feet

Cold Riveting.

In riveting, the riveting blows should be given with a ball-faced hammer, and delivered with a view to stretch the whole end face of the crank-pin evenly. Otherwise the riveted surface will be apt to split. This usually occurs from not riveting the area at and near the circumference sufficiently, although it may occur from riveting that part of the area too much. The line of travel of the hammer should not be directly vertical but somewhat lateral in a direction from the centre toward the circumference. If the countersink is a deep one, it is desirable to leave the crank pin sufficiently long, so that after the riveting has proceeded some time the surface of the metal which has become condensed and crystallized from the direct impact of the hammer blows, may be chipped away, leaving a surface that is swollen by the riveting without being so much condensed. This enables a much greater spreading of the metal without splitting it. If in this class of work the riveted piece (as the crank-pin) is not driven in very tight before riveting, the riveting blows will be apt to jar the pin back. Hence it is necessary to occasionally drive the pin home. The riveting should proceed equally all over, as if one side be welded in advance of the other it tends to throw the pin out of true. When, however, the riveting begins to bed the pin, four equidistant places may be riveted home in advance so as to bring the pin home and hold it firmly.

Steel Axles.

Objections have been taken to homogeneous steel axles, on the score of their liability to break suddenly and without warning. The axle is formed by casting a steel ingot around a core of fibrous wrought iron, which, under the subsequent hammering or rolling of the ingot, is elongated along with the steel, forming a central core of wrought iron the whole length of the axle. The result is a very close practical approach to the principle of a hollow railway axle. The continuity of the axle being broken by the interposition of another ductile material, any fracture taking place will be confined to the outer or less ductile material, and the complete rupture of the axle into two or more disconnected parts is avoided.

Planing the Edges of Boilers.

A very simple method of planing at any required angle the edges of boiler and other plates, where this is needed to facilitate calking, is thus effected: Instead of packing the plates at the required angle on the machine, as usual, the tool itself is made to work at any desired angle. This is accomplished by a swivel head working upon two trunnions, and moved backward and forward by a worm and worm-wheel, and which is locked fast in any position by means of bolts in radius slots on a radical plate attached to the slide. The machine itself consists of a long bed with a raised part for carrying the plates, and above this a girder with clamp screws for holding the plates in position. The tool is arranged to cut both ways, and is moved by a screw with reversing action.

Lubrication.

BY THOMAS FARMER, F. C. S.

In a steam engine, where many parts are moving, a large amount of friction is produced, which tends to stop those parts, and it would ultimately do it, were they not continually re-supplied with fresh motion obtained by the burning of fuel. Hence it is apparent to everyone, that the engine must not only overcome the resistance of the work to be done, but also the resistance offered by its own parts. In other words, the amount of heat manifested in friction is the amount of extra heat that will have to be generated under the boiler, and the extra cost of working will be the cost of the fuel necessary to produce the heat. From the experiments of Morin, we find that the friction of a cast-iron shaft upon a dry bell-metal bearing amounts to 0.20 of the transmitted power, while with a wrought-iron shaft the friction is more than 0.25; therefore, if such shafts were dry and unlubricated, one-fifth and one-fourth respectively of the total fuel cost would be wasted in overcoming friction. By careful lubrication of the same shafts, the loss may be reduced to 0.065 in the one case, and 0.089 in the other. Hence the importance of a good lubricant. One of the next essential points is that it shall be properly distributed over the surface on which it is required, that just sufficient shall be used and all waste avoided; otherwise, what would have to be spent in overcoming friction will have to be spent in buying oil. Putting aside the commoner characteristics of a good oil, such as the absence of acidity, either natural or artificial, and the absence of gumminess, one of the most commonly believed ideas is, that an oil of high specific gravity is the best for lubricating purposes. Although this may be true in certain cases, yet from observations and experiments made over a long period I have found that they are not always the best, and that the point upon which we must rely is the *viscosity*. The question next arises, How is this viscosity basis to be applied? If an oil of very high viscosity, such as castor or rapeseed, were used to lubricate an engine of low horse-power, we should in all probability find that, instead of reducing the friction to a minimum, it would itself become a source of resistance and increase the evil. And conversely, if an oil of very low viscosity were used to lubricate an engine of high horse-power, we shall find that the friction would be but slightly, if at all reduced. Hence, when we come to look at extreme cases, we see that there exists a very marked connection between viscosity and horse-power. A high viscosity is not suitable for a low horse-power, and, conversely, a low viscosity is not suitable for a high horse-power. And just as the case holds for these extremes, so does it hold for every point between them; the viscosity must always keep parallel to the horse-power. The same rule holds with respect to machinery, and to insure perfect lubrication the viscosity must gradually increase with the ponderousness. From this it is clear that economical lubrication does not consist in procuring and using the thickest oil possible, but the oil which is best adapted to the nature of the machinery, and scientific mixing likewise consists in compounding oils most clearly adapted to the purpose for which they are to be used. It is rather difficult to say what oils are most suitable for mixing purposes, but it may be stated with a tolerable degree of accuracy, that the best method is to take a basis of American mineral oil 885 degrees to 903 degrees sp. gr. and add either olive, lard, rapeseed or castor, to "work up" the viscosity. Olive and lard, when mixed with mineral in proportions 10, 20, 25, and so on up to 75 per cent., are about equal in value as lubricants of the lighter class of machinery. Rapeseed oil in like proportions is valuable where the machinery is of a heavier kind, or where the lubricant has to be used throughout a works in which the machines vary much; but in such a case it will be better to divide them into classes, and use a special oil for each class. Castor-oil mixed with mineral in varying proportions may be used in the case of the most ponderous machinery. A properly mixed oil is in every case preferable for general use to any other oil used singly.

THE Senate has passed a concurrent resolution which favors a reciprocity treaty with Mexico, and provides for the first step towards securing such a treaty by requesting the President to bring the subject to the attention of the Mexican government.

PRACTICAL MECHANICS.

How to Figure Speed—The Reason Why.

In selling machinery, the maker usually recommends that it can be run at a certain rate of speed which has been demonstrated by experience to be most favorable to its successful operation. To fix upon the relative size of pulleys to be used in communicating this motion from the "line shaft," is a calculation which seems to be very imperfectly understood by the average mechanic. Conversation on the subject with a large number of engineers, millwrights and others has led us to think there was a demand for more light, and accordingly we offer the following system, the convenience and accuracy of which has been proved by years of practical use. This simple example will illustrate:

Given, a 20-inch pulley revolving 100 revolutions per minute, a belt from which will drive a 10-inch pulley how fast?

The "rule" laid down in the "books" says, "Multiply the diameter of the driving pulley by its revolutions per minute, and divide by the diameter of the driven pulley." We find no fault with this rule, but would suggest that the teacher and text book of the future will be successful in proportion as they abound in "reasons why," and give the student principles from which to form his own rules. As every rule must be based upon a principle, when one is familiar with the latter the former becomes self-evident and not easily forgotten.

The speed of a driven pulley will bear exactly the same relation to the speed of its driver as its diameter does to the diameter of the driver.

In the above instance, the driven pulley being smaller, let its size represent the denominator of a fraction, of which the diameter of the driving pulley shall stand as a numerator, thus:

$$\frac{20}{10} \text{ of } 100 = 200$$

Or, suppose the diameter of driver was 25 inches, its speed 180, and a speed of 600 was required, what must be the diameter of driven pulley?

Reasoning: Since the speed must be greater, its diameter must, of course, be less than that of the driver. How much? As much less as its speed is greater, thus its size will be

$$\frac{180}{600} \text{ of } 25 = \frac{75}{10} \text{ or } 7\tfrac{1}{2} \text{ inches.}$$

This not only leaves less room for a misstatement of the problem, but in most cases the multiplications and divisions may be made mentally, thus saving time and avoiding liability to error.

These advantages are of still greater importance where intermediate pulleys or "counter" shafts are used to multiply motion.

Finish of Guns and Rifles.

The finish of the various portions which make up a gun or rifle is effected by valuable machines, which carry drills, bits, grinders—or wheel cutters—all made to gauge and tested thereby, and which drill or open out the internal parts of the portion to fit on. These are placed on mandrils, etc., corresponding to their internal configuration, and which, firmly held there, have their external contour delineated by machines fitted with tools which operate as a planing machine horizontally, as a slide-rest perpendicularly, or as rapidly-revolving "grinders"—i. e., toothed steel wheels; the amount of "cut" is determined by the "tracer," which follows the contour of the model of the part desired to be copied and reproduced. The "tracer" defines the tool cuts, the depth of the cut is determined by the model traced, but all the machines, however numerous, are simply copying, though copying with undeviating accuracy, even to the three-thousandth part of an inch. It is scarcely necessary to assert that no hand labour could accomplish such accuracy or such unvarying uniformity. There are machines to produce and all but finish every part, though the irregular forms of some show that their internal and external contours necessitate the employment of many different machines. The breech action itself is machined, cut and carved all over to the greatest nicety. The barrels, accompanied by the machine action lock, and furniture, are transferred to the filing department, and respectively pass into the hands of the "jointer," filer up and smoother. Then the barrels, with action attached, are forwarded once more to the proof-house for definitive or final proof, a test for both barrels and action. If the result is satisfactory, and everything pronounced to be sound, the definitive proof-mark is added. They are then transferred to the warehouse, where they are passed over to the "stocker"—with the necessary walnut-wood, which forms the stock—who skillfully fits on and shapes up the butt and fore part. Next they are passed to the "screwer," who fits all the pins and screws to hold the iron and wood together. Workmen then fit the hammers, and the barrels are subsequently fine-bored, and, if choke-bore, choke-regulated. The barrels are then tested for shooting, both as regards pattern and penetration. The number of pellets striking a 30-inch circle is always counted, full-choke bore giving about 220 pellets in the circle, with a charge of 1⅛ oz. of No. 6 shot, the cylinder-bore doing from 130 to 140 pellets, only, in the circle. After having been passed for shooting the gun is transferred to the finisher, who takes off all the woodwork, chequers the butt and fore part, and forwards the ironwork to the polisher, who, in his turn, passes it to the engraver. The latter, after having completed his artistic task, returns it to the polisher for the purpose of being hardened and blued. In the meantime the barrel has been finally smoothed up, engraved and browned. The action in its hardened state, accompanied by the barrels, then passes into the hands of the "action-freer," who exercises his skill and judgment in making all the parts work easily, reducing the size of the barrels to compensate for the swelling of the action in the operation of hardening. The hardening process may be thus described: An iron pan, about 10 inches by 4 inches, open at the top, is partly filled with bone-dust. The action-work, being completely embedded in the osseous particles, is put into a furnace, where it remains for about an hour, at the expiration of which period it is removed and turned out into a vessel containing cold water. This operation has the effect of thoroughly hardening the surface and imparting the beautiful colours that are so much admired for the tone and tint shown on this portion of the gun. The finisher subsequently puts the entire weapon together, and it is finally regulated by men specially employed for the purpose, the gun being then pronounced complete.

Riveting.

The direct crushing strength of wrought iron is generally about equal to its tensile strength, in the case of short isolated bars, but the metal around the rivet hole in a boiler plate is in a different condition, being supported by the surrounding unstrained metal of the plate. Direct experiments which have been made on plates, with the object of ascertaining the crushing strength under these circumstances, show on an average the crushing resistance may be taken at twice the shearing resistance, consequently, in order that the shearing resistance of the rivet and the crushing resistance of the plate may be equal, the area of the rivet shank should be equal to twice the product of the thickness of the plate multiplied by the diameter of the rivet. Deducting from this the value of the diameter of the rivet in terms of the thickness of the plate, we find that it should be 2¼ times the thickness of the plates. This is the theoretically correct size of the rivet, but practically it is found necessary to make the rivet somewhat smaller for the following reasons: First, if the rivet is given the above size, when we reach thicknesses of plate above seven-sixteenths of an inch, the rivet becomes too large to be properly closed by hand riveting; second, the material of the plate is somewhat injured by the punching and cannot always be relied upon to bear twice the shearing strength; third, it would be necessary to space the rivets so far apart, to retain equal strength of plate and rivet, that it would be impossible to make a steam and water-tight joint; fourth, the plate is more apt to be reduced in thickness by corrosion than the diameter of the rivet is, so it is found better to give it an excess of strength at the start to allow for wear. For these reasons the diameter of the rivet is made as small as twice the thickness of the plate, and even smaller for the thicker plates. By placing rivets in two rows, which is equal to one-half of the pitch, a much tighter and stauncher joint can be obtained than is possible when they are placed in the form of an equilateral triangle as they generally are, which necessitates a reduction of the pitch to obtain a tight joint.

Gold Beating.

To produce light and dark shades of gold leaf the metal is alloyed with silver and copper. The addition of the baser metals lessens the malleability, and as the leaf is sold by superficial measure, and not by weight, adulteration is kept at the minimum. The pure gold having been brought to the desired color by the addition of silver and copper, it is cast into ingots ¾ of an inch wide and of two ounces weight. These ingots are passed between polished steel rolls and flattened out into a ribbon of 1-800th of an inch thick. It is annealed and cut into pieces one inch square. The metal is now about ready for the merciless hammering it is to receive from the gold beater, who prepares a pile of 150 leaves of the metal in layers, with leaves of vellum, and encloses the whole mass in a double parchment case. Now, with a sixteen-pound hammer he beats the pack until the inch pieces are increased to four inches square. The next movement is to remove the leaf, divide it into four parts and prepare another pile or pack, this time using gold beaters' skin instead of vellum, and enclosing it as before in a parchment case. This pack is beaten with an eight-pound hammer; another quartering produces 2,400 leaves, leaving an area of about 190 times that of the ribbon, or the thickness of 1-200,000th of an inch. The marvelous malleability of gold is shown by the fact that an ounce of it has thus been beaten out or extended to a surface of nearly 100 square feet.

Annealing of Soft Iron.

The annealing of wrought iron is not often necessary, and when it is done it is one of the simplest mechanical processes—a heating for a limited period and a gradual cooling. But hard cast iron requires a long-continued heat to soften it. In some establishments where very minute iron castings are made, it is absolutely necessary to anneal them, even when they are not to be subjected to any tool processes. The mere attrition and collision of the tumbling barrel would reduce them to fragments. As they come from the sand mould they are as brittle as unannealed glass. To anneal these castings, they are packed in cast-iron boxes with coarse sand—ordinary quartz sand—and submitted to a good red heat for forty-eight hours, and then allowed to cool gradually. The heat is not sufficient to fuse the sand, nor even to efface the sprew print or round the sharp corners of the castings. The sand is merely vehicle for the heat and a means of retaining it, and this annealing is similar to that of wrought iron, or of steel.

Cleaning Horses by Steam.

A curious machine, which cleans horses by steam, is in daily use at the Third avenue railroad stables, New York City, replacing the currycomb. Its standard rate is 100 horses in ten hours, but it has cleaned 122 between 7½ A. M. and 5.40 P. M., with an hour's intermission for dinner. To test it extra speed was put on, and one horse was actually cleaned in 1m. 15s., and more thoroughly than by the ordinary process. The horse is led under a bar, from which depend on each side of him arms with universal joints. Turning on the arms are brushes a foot in circumference. These are revolved by steam through the arms and cross bar at an ordinary rate of 800 revolutions a minute, which can be increased to 1,000. A man on each side takes hold of the arm close to the brush, and applies the brush to the horse. The steam that whirls the brush makes a noise a good deal like the hissing of a hostler. The universal joints allow the arms and brushes to be moved in any direction. Beginning at the head, the men move the brush along the sides, back, and belly, and down the legs of the horse to the feet. A cloud of dust arises in the air, and in two minutes the horse looks like a different creature. The horses were a little nervous at first, but after a few seconds all appeared to be pleased with the operation. At the Third Avenue Railroad stables it takes six men 13½ hours to clean or half clean 128 horses by the ordinary process. If the steam brush is passed over the horse at a moderate speed once, each square inch is actually brushed more than if an ordinary brush had been passed over it 400 times. The dust settles on the floor, accumulates rapidly, and is shovelled into a wheel-barrow and carried away.

The track of the New York, Chicago and St. Louis Railroad is now laid from Hammond, Ind., west 31 miles; from Ft. Wayne east to Vermillion, O., 150.34 miles; from Cleveland, O., east to N. Y. east five miles. This is a total of 375.04 miles, making 60.66 miles laid since our last report. Between Ft. Wayne, west, and Hammond, Ind., east, there is a small gap, about three miles, which is delayed by heavy work. From Vermillion, O., to Cleveland, the distance is about 36 miles, on which the grade is now finished, and tracklaying will be pushed. In Cleveland, the heavy earth work is well advanced; the masonry for the double track viaduct is about finished; and the erection of iron work will be commenced at once. East of Cleveland, track is laid from the Cleveland & Pittsburgh crossing to Nineteeth street, Erie, Pa., and is also being laid from Brocton, N. Y., east. Ballasting is progressing rapidly; several fine gravel pits having been purchased, and seven steam excavators are at work loading the cars, which are unloaded by several ballast unloaders.

Tramways.—Consul Segrave, in his report upon the trade and commerce of Nantes, states that city possesses an admirable system of tramways, worked upon the compressed air system, and although used in the busiest portions of the town, no serious accident has occurred. The quays are at all times crowded with every description of vehicles, yet horses seem to pay no special attention to the cars and to work quietly beside them. The engines there draw two cars capable of holding fifty passengers each.

When writing to advertisers mention this paper.

RAILROADS AND TRAFFIC.

A PARTY of capitalists have been quietly perfecting the details for several weeks past, of a new and important line of railroad, a continuance of the Wheeling & Lake Erie system, to extend from Wheeling to the extreme northwestern part of Ohio via Coshocton and Mt. Vernon. The projectors are men of capital and experience, and the road will be almost an air line from the best coal fields of Southwestern Ohio to the lumber regions of Michigan. The title of the corporation for which a charter has been obtained, will be known as the Mt. Vernon, Coshocton and Wheeling Railroad. An old canal bed will be utilized.

IN consequence of the strike of coal miners in the Del Roy district, the coal traffic on the Connotton Valley Railway has been materially lessened. The endeavors of the miners of some of the mines to go to work at 60 cents per ton were frustrated by threats of personal injury from Welsh miners, who were determined to hold out for 70 cents.

AT the regular monthly meeting of the board of directors of the Baltimore and Ohio Railroad Company, semi-annual cash dividends of 5 per cent. were declared on the stock of the main stem and of the Washington branch, leaving a surplus of upward of $600,000 of net earnings, which are being applied for purposes of construction.

To date $15,000,000 of Northern Pacific preferred stock has been cancelled, by being received at par payment for land purchased from the company. This leaves $36,000,000 outstanding.

RUMOR still insists upon the early consolidation of the New York Central and Lake Shore Railways, and now adds that the Chicago & Northwestern is to be included in the consolidation.

A COMPANY proposes building a line of embaukment for a railroad five feet above high water mark, running along the east side of the Mississippi River, from Memphis to Vicksburg, thus forming at once a levee and roadbed, Government guaranteeing the bonds.

IT is now charged that the Grand Trunk is no longer disposing of old contracts, but is cutting the regular tariff rates.

THE Elevated Railway Companies of New York will offer no opposition to the reduction of their fares 100 per cent. by the Legislature.

J. H. WELL has brought suit against John McKechney on a promissory contract for building the Ohio and West Virginia Branch of the Columbus, Hocking Valley and Toledo Road. The petition sets forth that McKechney, on July 11th, 1881, received from Miller, Thomas & Co., and Orlando Smith, $69,000, and asks for an order of attachment on Samuel Thomas, W. N. McCracken and others. Other orders are put in, making a total of $162,641. When this road was sold to the Cleveland Syndicate, a year ago, Deshler, Smith, Green and Thomas owned most of it. It is said that they have had trouble in the distribution of the proceeds of the pool, and that Thomas has prepared to bring suit for $110,000 claimed to be due.

THE circular issued by the trunk lines of a change in rates upon live stock and dressed beef, has been cancelled.

A RAILROAD attorney stated at Akron that the attorneys of the Cleveland, Akron and Columbus, late Cleveland, Mount Vernon and Columbus Railroad, were greatly embarrassed by a recent decree of the District Court, ordering a new sale of the road, because the previous sale was hurried through pending an appeal by the Trustees of the Pennsylvania Railroad bondholders. The effect will be a readvertisement and reselling of the road; but just how this will be accomplished, and how the road will be operated in the interim, is causing much trouble. It is believed, however, that the legal obstacles will be removed in time, and that the Holland bondholders will once more come into possession of the property.

WORK on the New Orleans Pacific is very steadily prosecuted. It has not suffered much from high water.

THE New York Central & Hudson River has four continuous tracks from Albany to Buffalo.

THE Cuyahoga Valley Railway stockholders held their annual meeting in Cleveland on Wednesday last. The total earnings for 1881 were $275,673; less operating expenses, $151,915; net earnings $123,757. The deduction for income tax of $4,798 and interest on bonds of $118,959, left a balance of $6,959.

A NEW thing in Chicago is the Accommodation Car Company, which has begun operations there with a capital stock of $1,000,000, divided between the patentee, T. T. Prosser, and F. F. Cole, a real estate man. The object of the company is to build and equip a thousand cars and put them upon the streets of Chicago. The car, mounted in the middle upon a truck which sits on four wheels, each about one foot in diameter, which are held only to the car by a set of wheel clamps.

MINES AND MINING.

THE Richards copper mine, in the Blue Ridge, Page county, which has not been worked for many years, is again the seat of activity. A mining camp has been formed, cabins erected, blacksmith and cooper shops put in operation, and a magazine for the storage of dynamite, fuses, &c., is now being constructed. The ore, of which a large amount is already out, will be assorted, barrelled, and shipped to Baltimore for reduction, at an early day.

EACH week, says the N. Y. Mining Record, produces a crop of Comstock assessments with the result of making legitimate owners of stock feel very gloomy, and it appears now to be a question how much longer this thing can be kept up. The market for Comstocks here has followed, in a great measure, the daily quotations received from the Pacific Coast.

FROM present indications Coltsville, O., and the country to the east of it, bids fair to be the future coal region of that section. Andrews and company have several farms leased near the State line, among which are those of Ambrose Shields and H. S. Boyd, of New Bedford. We understand that steam drills will soon be set to work. A few miles further to the east, on what is known as the five hundred acre tract, Youngstown capitalists have three sets of drills at work, and have discovered a four foot vein of coal at a depth of ninety feet, which, though not block, is of a superior quality. This territory lies along the projected line of the Pittsburgh and Western Railroad. Between Bedford and Hubbard most of the land is under lease, along a revived branch of the Lake Shore from there to New Castle. Messrs. Miligan and Allen, who opened a successful mine on the David Stewart farm, near Youngstown, have organized a a prospecting company, and will confine their operations to that township.

THE dividends of the Tombstone Mines, Akron, for the first quarter ending March 31st, amounted to $612,500. The bullion yield was $475,405, the balance of the dividends being paid out of surplus funds.

A CORRESPONDENT of the N. Y. Mining Record writes from Placerville, Col. Within the limits of Eldorado county, exist miles and miles of lava-capped gravel hills, rich in the precious metal. These deposits are being worked to some extent, with good results, but only a tithe of these rich deposits have been even prospected. Extending across the country, say ten miles east of Georgetown, and to the eastward of Volcanoville, is a belt of country in which a pick has not been struck. Indications are abundant of the hidden wealth, but the easier mines have been worked in past years, and the fact of the depth and expense of opening these deep deposits, has preserved them from the Chinese.

THE following Lake Superior Copper Mines have sent in the figures given below, representing their yield in March: Calumet & Hecla, 1,825 tons; Atlantic, 151 tons; Franklin, 150 tons; Allouez, 101 tons; Pewabic, 73 tons; Grand Portage, 38 tons, making a total of 2,339 tons.

THE Silver Bell Mine, Dakota, which has two short tunnels, forty and twenty-eight feet, and two shafts twenty-five and thirty feet in depth, discloses large quantities of native silver sulphate. The assay gave the astonishing result of $6,966,775 ounces of silver and 5,825 ounces gold, equaling $7,92,318 in gold and silver to the ton. As the specific gravity of this ore could not be less than four, eight cubic feet would make a ton, and we have the astonishing result of a cubic foot yielding nearly, if not quite, $1,000 in gold and silver. This ore is found within twenty-five feet of the surface.

THE first locations made in the Tombstone district, Arizona, were made in 1878. There are now over 1,000 locations or claims in the district, and upward of 2,500 inhabitants. The output of the precious metals, gold and silver, up to January 1st, 1882, aggregates $7,359,200, and over $3,000,000 have been disbursed in dividends.

A FOUR-FOOT vein of coal has been discovered in Ross county, Ohio, and preparations are making to open the first coal mine ever operated in the county.

THE Department of Internal affairs of Pennsylvania has just issued the annual report regarding mining in that State. A recapitulation for the tabulation of anthracite coal for 1881 is as follows: The total number of collieries, 319; average number of days worked during the year, 275,01; total number of employees, 75,169; total amount paid in wages during the year, $27,454,781.36; total production of anthracite for 1881, tons, 27,929,128,18; average amount per ton paid in wages, $1,0655; average amount of coal produced per employee, 373 tons. There are 382 bituminous collieries in Pennsylvania—These employ 35,530 men and their pay roll amounts to $14,540,057, annually. Their total annual production aggregates 15,692,023 tons, while the 6,640 coke ovens in blast last year turned out 2,176,403.

AT the Baltimore and North Carolina Mine, N. C., a new vein has been opened at a depth of 130 feet, which is two feet wide, and specimens analysed pan out from $900 to to $1,500 per ton. This mine is said to be in fine working order, and promises rich results.

THE Homestake Mining Company will pay, on the 25th inst., their usual monthly dividend, this time raised to forty cents a share, and aggregating $40,000. Total of forty-four dividends, $1,330,000.

THE Deadwood-Terra Mining Company paid their seventeenth monthly dividend on the 20th instant, one of fifteen cents; aggregating $30,000. Total of dividends, $650,000.

MISCELLANEOUS RECEIPTS.

FLOUR PASTE.—Flour, 4 oz.; water, 1 pt.; nitric acid 40 minims; oil of cloves, 5 minims; carbolic acid, 5 minims; thoroughly mix the flour and water, strain through a sieve, add the nitric acid, apply heat until thoroughly cooked, and when nearly cold add the oil of cloves and carbolic acid.

A STRONG CEMENT.—One of the strongest cements, and very readily made, is obtained when equal quantities of gutta percha and shellac are melted together and well stirred. This is best done in an iron capsule placed on a sand bath, and heated either over a gas furnace or on the top of a stove. It is a combination possessing both hardness and toughness, qualities that make it particularly desirable in mending crockery. When this cement is used the articles to be mended should be warmed to about the melting point of the mixture, and then retained in proper position until cool, when they are ready for use.

TO MAKE A STRONG MUCILAGE.—Persons are often at a loss for very strong mucilage, having sufficient power of tenacity to fasten sheets of pasteboard together. The following cement is recommended by a scientific authority; it has the additional advantage of being waterproof: Melt together equal parts of pitch and gutta percha. To nine parts of this add three parts of boiled oil and one-fifth part of litharge. Continue the heat while stirring until a thorough union of the ingredients is effected. Apply the mixture hot or somewhat cooled, and thinned with a small quantity of benzole or turpentine oil.

GOOD GROUND FOR JAPANNING.—A good black ground for japanning is prepared by grinding fine ivory black with a sufficient quantity of alcoholic shellac varnish on a stone slab with a muller until a perfectly smooth black varnish is obtained. If other colors are required the clear varnish is mixed and ground with the proper quantity of suitable pigments in a similar manner. The following are good common black grounds: (1) Asphaltum, 1 lb.; balsam of copaiba, 1 lb.; oil of turpentine, q. s. The asphaltum is melted over a fire, and the balsam, previously heated, is mixed with it; the mixture is then removed from the fire and mixed with the turpentine. (2) Moisten good lampblack with oil of turpentine, and grind it very fine with a muller on a stone plate; then add a sufficient quantity of ordinary copal varnish and rub well together. (3) Asphaltum, 3 oz.; boiled oil, 4 quarts; burnt umber, 8 oz.; oil of turpentine, q. s.; melt the asphaltum, stir in the oil, previously heated, then the umber, and when cooling thin down with the oil of turpentine. An extra black is prepared from—amber, 12 oz.; asphaltum, purified, 2 oz.; boiled oil, ½ pt.; rosin, 2 oz.; oil of turpentine, 16 oz.; fuse the gum and rosin and asphaltum, and the hot oil, stir well together, and when cooling add the turpentine. A white ground is prepared from copal varnish and zinc white or starch. From one to six or more coats of varnish are applied to the work in japanning, each coat being hardened in the oven before the next is put on.—*Engineer.*

TO RENDER CLOTH WATERPROOF.—In the Reimann process for rendering cloth waterproof, the fabric is passed slowly by machinery through a tank divided into three compartments, the first containing a warm solution of alum, the second a warm solution of lead acetate, and the third pure water which is constantly renewed.

FACTS
For Machinists, Manufacturers and Others.

Value of the Indicator.—There can be but little doubt that the more frequent application of the indicator to our engines in the West will develop some startling facts, and will, if the record be heeded, occasion no insignificant saving. In some of our Western cities coal is so comparatively cheap that a very low grade of expansion is found to be most economical and is frequently resorted to. Now, since with the institution of expansion came the use of the indicator, it is not an unpopular error, that when the grade of expansion is low, the use of the indicator becomes proportionally valueless. We had occasion lately to examine some cards, which we are forbidden to publish, but which, if presented, might well serve as a text for an extended sermon on the value of the indicator, were it not that the mere inspection of the cards themselves would prove the most eloquent sermon desirable. The steam supply and exhaust pipes and ports were evidently much too small, and all the valves leaked and were wrongly set, as evidenced by a fall of pressure from 100 pounds, in boiler to 50 pounds in entering the cylinder, by "wire-drawing," by an expansion line, at only two expansions, which was a straight line far above the hyberbolic iine throughout, by an excessive back pressure and a compression line starting before one-half the return stroke was completed, with admission of steam during such compression, and a compression to a pressure above that of the pressure of steam at admission. Altogether the card might have been considered in the light of a "curio" (if it was not considered typical of others) and the valve gear was in the most dilapidated condition. The engine evidently consumed 2½ times the amount of coal it ought to have consumed. Even at $1 to $2 per ton of coal, a saving of $3,000 to $6,000 or more a year would have been occasioned in the coal account for a number of years past by an earlier application of the indicator, and either remedying the defects of the old engine, or consigning it to the scrap-heat and purchasing a new engine. Nothing pays better than the application of the indicator; every large engine ought to have it a permanent fixture, and smaller engines ought also to be provided with it, or indicator cards be taken from them by an expert at least once annually. If the card shows the engine to be in good order, it is worth the outlay to know this fact, and if it shows the existence of some defect, the defect need be but very small for its speedy remedy to far outweigh the expense of the application of the indicator. It is our own impression, that it will not be many years before the purchase money of an engine will include the price of an engine indicator and rig, unless otherwise ordered, same as oil-cups are now included in the price of engines. It is but just to add that as far as our experience goes, this would meet the ideas of the most prominent engine builders, all of whom justly appreciate the value of the indicator, and wish to ensure the most economical performance of their engines.—*Amer. Engineer.*

Preservation of Iron.—A novel way of preserving the surface of iron has just been discovered. The treatment is as follows: The iron is subjected to the action of diluted hydro-chloric acid, which dissolves the iron, and leaves on the surface a pellicle of homogeneous graphite, which adheres well to the surface of the iron. The piece to be preserved is next treated, in a hydraulically closed receiver, by hot or cold water, or better, by steam, in such a manner as to completely dissolve and remove the chloride of iron formed. Finally, the piece of iron is left to dry in the receiver, from which all liquid has been removed; a solution of caout-chou, gutta percha, or gum-resin in essence of petroleum is then injected. On the essence being evaporated, there remains a solid enamel-like coat on the surface of the iron. Instead of previously eliminating the iron coat, it may be utilized in forming a kind of vitreous enamel. For this purpose the iron is immersed, after treatment with the acid, in a bath of silicate and borate of soda. A very pure and brilliant silico-borate of iron is formed, which closes up the pores of the metal. As to the disengaged chlorine, it combines with the free soda, forming chloride of sodium, which remains dissolved in the liquid. Thus the important question of the preservation of iron appears to have been brought another step towards solution.

Useful Hints.—The Canadian Manufacturer remarks: It is not beyond the range of possibility that steam engines may yet be built capable of working on one pound of coal per horse-power per hour, and surely within the future something better will yet be discovered. But, without waiting for that, much can be done to make engines as we now have them more economical. The most common sources of loss in an engine are condensation in the pipes and cylinders, leakage at the valves and piston, improper setting of the valves, excessive back pressure, etc. How are these to be discovered and corrected? A well conducted test of the amount of fuel consumed, quantity of water evaporated by the boilers, and amount of power given off by the engines as shown by indicator diagrams, will usually discover the real condition of the engine, etc. An engine giving off a total of 60 horse-power was found by the indicator diagrams to be using 25 horse-power to get rid of the exhaust steam from the cylinders, and had been working in this condition for years, the loss of so much power never having been even suspected till the indicator diagrams revealed it. Many engines are running in this country, close beside streams of water, and exhausting the steam into the air, when by the addition of a condensing apparatus a large increase of power could be obtained, or a saving of fuel effected. In an engine taking steam at 60 pounds pressure, and cutting off at half stroke, the gain of power by condensing would be about 32½ per cent, of which 2½ per cent would be required to drive the air pumps. Instead of adding a condensing apparatus, it is sometimes more profitable to use the exhaust steam for heating purposes, either work rooms, drying rooms, or water; and the question comes up, how much heat is available from exhaust steam? More than 100 years ago it was observed that steam at the temperature of boiling water gave out a large quantity of heat while being condensed into water which still showed the same temperature. It was also clearly established that water of 212° temperature could not be converted into steam of 212° temperature without the addition of a large amount of heat, and to this was given the name 'latent heat.' More modern experiments have shown that while the addition of 152 units of heat to a pound of water at 60° will make it water of 212°, other 966 units must still be added to make it into steam of 212°. Nearly the whole of this quantity, and indeed often much more, remains in the exhaust steam, and is released from the steam while it condenses into water, and ought not to be allowed to go to waste, where it can be put to any useful purpose. Sometimes the attempt to use exhaust steam for heating purposes has proved a loss instead of a gain, owing to the unskilful manner in which it was done, the loss of power from increased back pressure having been greater than all the gain of heating; but where the apparatus is properly constructed there need be no increase to back pressure.

Hardened Steel.—The well-known fact that steel is of less specific gravity after hardening has given rise to varied explanations as to the cause, but it seems no unnatural result when viewed in connection with the general experience with other metals under heat treatment. It is indeed a matter of surprise that so much doubt and difference of opinion should exist. In tempering or hardening, the steel is heated to the required temperature and then dipped into the hardening fluid, and thus undergoes a rapid cooling process. The effect of the rapid cooling is to hastily set the outer surface of the steel with a slight contraction around the hotter and still expanded metal within, leaving the volume of the steel a trifle greater than if all the molecules had been cooled simultaneously and allowed their own share in contraction, which would have the effect of a gradual cooling of the steel, when the metal would have returned to its original constitution prior to heating. It is for the same reason that a steel bar being heated and one face only dipped into the cooling or hardening fluid will be longer on the tempered or cooled face than on the untempered face, demonstrated in the bending of the bar, the hardened portion being the outer or longer surface of the bend. The tempered face is cooled suddenly and "set" while the bar is still of nearly a length due to the expansion of heat and the rest of the bar in cooling has gradually a tendency to shrink or contract normally, but is affected by the set condition of the tempered portion. The bar, if of wrought iron, would not show as great a bend as if of steel, owing to the fact of wrought iron being a somewhat better conductor of heat, and to the greater freedom of action in the molecules of wrought iron thon those of steel. The result of a similar treatment of copper (gold or silver) would be much less marked than in either steel or wrought iron, with correspondingly less variation in specific gravity, the heat conducting powers and freedom of molecular action of the former metals being much greater than of iron or steel. Glass or porcelain being very poor conductors of heat and the molecules having little freedom of action, snap asunder under the same treatment. To recapitulate: The specific gravity under the circumstances mentioned above would vary inversely as the power of heat conduction and freedom of molecular action of the various metals or substances experimented upon.—*American Engineer.*

Pig Iron.—Gray forge, is used in rolling-mills to make merchant iron, structural iron, plates, etc. Foundry irons pass through the cupola only when they are reduced to a molten state, and at once turned into castings; but gray-forge pig is broken up, thrown into a boiling furnace in 500 pounds charges, more or less, and then, after melting, is subjected to the careful and skilful manipulations of the puddler from one and a half to two hours, after which the spongy mass is passed through the rolls. The purpose of this laborious operation is to eliminate the deleterious elements still further required to obtain the fibrous nature characteristic of rolled iron. Neutral iron is made out of either a neutral ore or out of a mixture of red short and cold short ores. It has less carbon than foundry, and greater tensile strength, and corresponds to Staffordshire, but differs from it in possessing greater strength and less silica and phosphorus. The Middlesboro' iron is used largely for rails and ship-plates, and is mixed with red short iron to produce a desirable grade of merchant bar. Much of English iron is cold short, because of the presence of phosphorus, and hence is not in favor among American consumers. Americans have become accustomed to a superior quality of iron, less liable to variation in strength. For the construction of water and gas pipes, English iron is often used to advantage, because great strength is not required. Bessemer pig, is comparatively a new product, and is divided into three grades, Nos. 1, 2, and 3, according to the amount of carbon contained. Bessemer iron is non-phosphoritic, and must be made of ores that will yield iron containing not over 1-10 of 1 per cent of phosphorus in the pig after reduction. Titantic acid often exists, and hardens the iron to an undesirable degree, and, when it occurs, it is an unwelcome and also unmanageable element. The largest deposits of Bessemer ores are in Spain, Algeria, the island of Elba, the Lake Superior region, Missouri, and the Cornwall ores of Lebanon, Pa. There are other deposits, and some of them give promise of profitable development. The cost is increased by scarcity in the face of an extraordinary demand, and also by reason of the distance between sources of supply and points of consumption. The present market value ranges from $6 to $10 per ton. These ores are used in the Bessemer steel rail manufacture almost exclusively, and are so named because they are chiefly used in the process invented by Sir Henry Bessemer, which greatly reduces the cost and labor of manufacture.—*Bradstreets.*

Combustibility of Iron.—The combustibility of iron has been demonstrated by Prof. Magnus, and is susceptible of proof in the following manner: The pole of a good-sized magnet is approached to a mass of iron filings, a bunch of which readily attaches itself thereto. In this condition, being not only in a highly comminuted state, but carrying a large quantity of air mechanically entangled in the loosely aggregated mass, the iron is in so favorable condition for combustion that the approach of an ordinary spirit lamp is sufficient to inflame it—in fact, it burns readily and continuously, like any ordinary combustible.

Wooden shoes are worn in the West, and enough of them are sold to keep a large manufactory going at Green Bay. They are cut out of green bass-wood, smoked and dried like hams, and sold at 25 cents a pair.

BLISTERS ON BOILER PLATES.—Blisters are one of the most common defects met with, and one of the most difficult to guard against in the selection of boiler plates. A very careful inspection of the plates will sometimes discover imperfect welding between the different laminæ of a plate, which would almost certainly develop into a blister under the influence of the intense heat to which it is subjected in the furnace of a steam boiler. The most common way to search for such defective places, is to tap the sheet lightly all over with a small hammer. This must be done on both sides of the plate, for sometimes the defect lies so near the surface that an examination of one side of the plate will fail to reveal it. When there is doubt in regard to the quality of a plate and the preceding test fails to resolve it satisfactorily, the plate may be suspended by the corners by means of cords, and the upper side evenly sprinkled with sand, and then the under side being tapped lightly with the hammer, the movement of the sand will reveal the presence and locality of the defect. In many cases, however, in spite of all precautions, defective sheets will be put into boiler shells, and when they are exposed to the action of the furnace heat blisters are sure to result. In many cases blisters never become serious; after attaining a certain size they cease to enlarge, and remain so for years. In other cases, however, they continue to enlarge rapidly, and unless their progress is arrested, serious trouble may result. When a blister appears on a boiler-plate it should be carefully examined at once, by someone who is competent to judge of its probable thickness, and form an opinion as to whether it may be likely to lead to serious consequences or not. If it is of a serious nature, it should be at once smoothly trimmed off with a chisel. This will generally, but not always, prevent further spreading and mischief. Sometimes they will continue to spread after they are trimmed, and penetrate the plate so deeply that they have to be cut out, and a patch put on the plate in their place. Cases have been known where, even after these extreme measures have been resorted to, the blistering has continued beyond the edge of the patch to such an extent as to necessitate the removal of the entire sheet. Blisters are liable to occur on any part of a boiler-shell which is exposed to the action of the heated products of combustion, but the furnace plates are oftener affected than any other part, for there the heat is greatest.

MINERAL AND VEGETABLE OILS AS LUBRICANTS.—Mineral oils, of proper specific gravity, lubricate as effectually for a lengthened period of time as vegetable or animal oils do when but freshly applied. The lubricating power of mineral oils increases in proportion to their specific gravity: therefore, on all heavy machinery, where friction has to be overcome under great pressure, the heaviest oils should be used. Mineral oils which are properly manufactured, and consequently free from gum and acid, retain their lubricating power unchanged in all temperatures so long as there is any oil on the bearings. Vegetable or animal oils, on the contrary, however pure they may be, gradually lose their lubricating power, owing to their combination with the atmospheric oxygen, which causes them to become thick, gummy, and finally dry—thus necessitating the frequent and thorough cleaning of bearings and shafts. Mineral oils have no tendency to oxidate, and consequently do not gum or dry. Of course, we only speak here of the heavy oils, the oils of small specific gravity being unsuitable for lubricating purposes. Vegetable and animal oils chill and become solid with slight cold, while mineral oils remain liquid in the coldest weather, severe frost causing them to become somewhat thicker, but never solid. The principal reason, however, why animal and vegetable oils should be superseded by mineral is the destructive effect of the former on the iron parts of the machinery. There are various causes for this. As already stated, fats consist of a combination of fat acids and oxide of glyceryl. This combination, by the action of water or steam, becomes decomposed, setting free the oxide of glyceryl. (It is in this manner, and based on this theory, that stearine is manufactured.) The same decomposition also commences, though slowly, in ordinary temperatures, through contact with the atmospheric moisture. The acids thus generated exercise a corroding influence on the iron, forming what is called metal soap. The iron gradually becomes porous, and in time is destroyed. To this injurious influence all parts of machinery are subjected, whether they come in contact with steam or not. The affinity of oxide of iron to the acids of fat, is so great that, chemically speaking, the iron corrodes immediately it is brought into contact with fat.

WESTERN FARMERS.—The financial condition of the country, the volume of business, and, to a large extent, the range of prices, says the Boston *Commercial Bulletin*, are absolutely dependent upon the condition of the farmers of the country. They constitute nearly half the population, and, according as their fortunes are prosperous or adverse, there will be activity and hope in the business circles of the country. In this connection, it is a noticeable fact that American farmers have for once, at least, enjoyed the privilege of buying in a cheap and selling in a dear market; and it is estimated by competent writers on the subject that they have realized fully 15 per cent. more on the value of their produce than they formerly did, and that during the past six years they have realized a net increase of $1,800,000,000 upon their former income. Hence it is that the farmers, especially in the West, have now become forehanded and are not inconvenienced by the incubus of mortgages, but have been enabled to add improved implements, fencing and building materials to their stocks of personal property, and generally feel more independent and prouder of their broad acres. If the foreign demand for American products in the years to come, coupled with good crops, shall reach only one-half or two-thirds the amount of the last two or three years, the American farmer as well as the people generally, will have reason to give thanks.

INGOT IRON.—At the last meeting of the Society of Arts, Boston, held at the Institute of Technology, Professor Whittaker stated that the chief requisites were ductility, uniformity, strength, durability and cheapness. Several metals in use for this purpose at the present time were described. Cast iron was declared to be unsatisfactory because its strength is uncertain, its quality varies, and it is liable to crack, and it does not give warning of an over-strain. The objection to the wrought iron used lies mainly in the fact that it all contains more or less dirt mechanically mixed in the interior or as scale on the exterior and the dirt will remain whether the iron is drawn into bars or rolled into plates, and when rolled out the dirt is liable to form patches. When this iron is used as boiler plates the dirt patches obstruct the passage of heat and cause over-heating of the remainder of the plate and thus weaken it. These patches can be removed by careful testing, but the iron then becomes too dear. In order to secure the most satisfactory results a metal must be employed which fulfils all requirements noted above, and the best metal for this purpose, the Professor claimed, was that called ingot iron or homogeneous steel, or what is known as Benzon steel made by the open-hearth process of which an interesting description was given. It was shown that by this process the metal became far more ductile and able to bear a far greater strain, and also that it can be made much cheaper. A description of a series of tests of this metal by the Naval Board at Washington was given which seemed to abundantly bear out the Professor's statements.

DIMENSIONS OF BOILERS.—Different makers differ in their rules for dimensions of boilers. The following estimates, however, are safe: For each nominal horse-power a boiler should have 1 cubic foot per hour; 1 square yard of heating surface; 1 square foot of fire grate surface; 1 cubic yard capacity; 28 square inches flue area; 18 inches over bridge. For cylindrical double flue boilers, an approximate rule is:

$$\frac{\text{Length} \times \text{diameter}}{6} = \text{Nominal horse-power.}$$

SPIEGELEISEN AND FERRO-MANGANESE.—It is reported that about 150,000 tons of spiegeleisen and ferro-manganese ore are used each year in the United States in making Bessemer and open-hearth steel, and it is chiefly imported as metal. It is also said that we have fuel and labor enough to produce this alloy within our own borders, from the large manganese deposit in the Southern States, which is now sent abroad and returned as ferro-manganese and spiegeleisen.

ITEMS OF INTEREST.

THE Welland Canal was opened on the 20th inst.

DR GLENN, the California wheat king, has seeded down 60,000 acres this season.

A LOCOMOTIVE lives about 30 years, which is a long time for an inveterate smoker.

CRUSHED coke is becoming a favorite household fuel in certain parts of the country.

AGASSIZ says: "The pupil studies nature in the school-room and when he goes out of doors he cannot find her."

THE Morgan line of steamers which have carried the mails between Havana and New Orleans, have been withdrawn.

THE New Orleans Times estimates the number of square miles of submerged bottom lands in the Mississippi valley at 10,000.

NEXT to the diamond, the ruby is one of the most remarkable stones for the exhibition of phosphoresence under electricity.

WE imported four hundred and nine thousand ounces of quinine last year at $2,57 an ounce—a falling off of eight thousand ounces.

IN forest beds near the delta of the Mississippi are found cypress trunks twenty five feet in diameter, and containing 5,000 annual rings.

THE sugar product of the Hawaiian islands for the present season is expected to reach 60,000 tons. Last season the product was 45,000 tons.

THE interest on the Brooklyn bridge is said to amount to $800,000 a year on bonds already sold on account of it, and it will not be opened till 1883.

REPORTS from two-thirds of the counties of Arkansas show the crops unusually advanced, extraordinary fruit prospects and a larger acreage of wheat than usual.

FORTY thousands acres of land in Arkansas have been secured for an Italian colony. The immigrants are to come from the Tyrol principally and will be agriculturists. About a thousand Italians have already settled in that region.

THE imigration from Germany this year promises to be very much greater even than last. From Hamburg alone about 42,555 persons set sail for America during January and February, as against only 5,812 and 3,757 in the corresponding periods of 1881 and 1880 respectively.

EDWARD S MORRIS, who was Liberian Commissioner to the Centennial Exhibition, has exhibited at New York a bar of steel ore taken from a mountain of that material in Liberia. It had not been smelted, but was as resonant when struck as the finest manufactured steel.

A CUBIC foot of air weighs 538.1 grains, or something over 1 ounce; 13.06 cubic feet weigh 1 pound. About 65 cubic feet of air furnish 1 pound of oxygen. An apartment 8 feet high, 12 feet wide and 13 feet long contains about 100 pounds of air; and a room 40 feet square and 18 feet high contains about a ton.

THE following test is given by the French Academy for distinguishing false gems from diamonds. If the point of a needle or a small hole in a card, when seen through the stone appears double, the stone is not a diamond. All colorless gems with the exception of the diamond cause double refraction.

THERE seems to be no end to the demand for wood pulp, and the profits of the trade in common paper seem now entirely dependent upon the wood used, as the rags generally cost as much per pound as the manufactured paper brings in the market. Wood paper of the proper proportion is better in many respects than all rag paper. It takes the ink better and makes a better body.—*Boston Mfrs. Gazette.*

A WELL known bear house says: We are of just the same opinion about the ultimate course of stock as ever, but we realize the fact that the biggest and most powerful manipulators the street has ever seen are present in the market in the shape of Messrs. Gould and Vanderbilt, and that their operations while amounting to nothing more than trading, are conducted on so gigantic a scale that it is useless to oppose them when once they are in.

It is proposed to construct a pneumatic railroad under the centre of London, the cars to be blown through air-tight iron pipes at the rate of twenty miles an hour. The pipes or tubes will be laid fifty feet under ground so as to fall below all sewers and other obstruction. The length of the proposed road is about six miles and a-half.

Discoveries of iron ore in Northern Minnesota may lead to the establishment of iron foundries in the Northwest. The iron is of a very superior quality, free from sulphur, very low in phosphorous and very high in metallic iron, which is suitable for the manufacture of Bessemer steel, and which is in all respects equal to the best ore in Michigan.

It was elicited from the Standard Oil Company at the trial at Harrisburgh, Pa., that since 1875 the undivided profits have increased the actual capital to an acknowledged sum of $25,000,000 in 1880, but which is now estimated at $35,000,000. In addition, over $10,000,000 has been declared in dividends in eight years.

The Union Oil Company, which is one of the opposition organizations to the Standard Oil Company, has voted to increase its capital stock to $5,000,000 in order to meet an outstanding indebtedness of nearly $2,000,000. For this purpose it will negotiate in Europe, if possible, a loan of $1,939,000, the greater part of which is to be used in paying off the indebtedness.

About 6,000,000 pounds of evaporated apples are at present exported to Europe annually. The fruit is sliced into pieces, one-sixteenth of an inch in thickness, and then exposed to the fumes of sulphur instead of drying in the sun. After drying, it is nearly as white as when first cut. The evaporated apples now sell for 15 cents per pound in European markets.

Prof. Ryder, of the Philadelphia Academy of Sciences, who for the past four or five weeks has been conducting a series of experiments at Fulton Market, New York, in the transportation of impregnated codfish eggs from that city to Washington, on behalf of the United States Fish Commission, has concluded his labors for the season, and returned to Philadelphia. About 10,000,000 fertilized have been forwarded in all. The experiments have been very successful, and it is thought that the best and cheapest manner of propagating the cod has at last been arrived at.

Coppering of Steel and Iron.—The use of cyanides in coppering of steel or iron is both prejudicial to the workmen's health, and expensive. M. Weil substitutes for them organic acids or glycerine, which are cheap, and are not decomposed, so that the baths do not require renewal of these matters, but merely a supply of oxide of copper. The coppering is done in three different ways, according to circumstances. (1) The pieces are immersed in the bath in contact with zinc wires. (2) Porous vessels containing soda lye are placed in the bath liquid containing the object to be coppered, and zinc plates in the lye are connected with those objects by means of thick copper wire. The soda lye serves continually, for when it is nearly saturated with zinc oxide it is treated with sulphide of sodium, which regenerates the caustic soda, precipitating zinc white, which may be sold. This method is very suitable for candelabra. (3) A dynamo-electric machine is used under the same conditions. M. Weil's copper-plated articles have fully approved themselves as regards durability, etc.

Improved Belt Stretcher.—An improved belt-stretcher has recently been patented, consisting of two clasps capable of grasping the belt tightly, and provided on opposite ends with pulleys, around which ropes pass, one rope being upon each edge of the belt. The ends of the ropes are attached to a windlass located between the clamps and operated by levers at opposite ends of the windlass, by a lever and pawl acting on a ratchet wheel in the center of the windlass. The clamps are made with a wedge-shaped serrated piece that clamps the belt in a wedge shaped mortice, an increase in strain on the belt increasing the pressure of the clamps.

To Tin Small Castings.—Clean and boil them with scraps of block-tin in a strong solution of cream of tartar.

Steel Castings.

BY F. W. PEAK.

Although steel castings are known, appreciated and largely used by many engineers, still it is a fact that at present a great number are either entirely unacquainted with them, or have conceived totally mistaken ideas about their nature and merits. Much of this misconception has, no doubt, arisen from the doubtful success which has attended the crucible steel castings brought before the public some years ago. The principal defects in those castings were hardness and want of solidity, and truly homogenous metal was a rarity. It was found that by crucible castings blowholes were less likely to be formed than in casting on a larger scale by the Siemens Martin or Bessemer processes; hence, notwithstanding the expense and the many disadvantages inherent in the crucible method, it has been somewhat extensively applied. In crucible steel castings a high per centage of carbon is employed to insure fluidity in casting, and the subsequent process of annealing is relied on to make them soft enough for working. In spite of every care these castings are often so hard as to be useless. A further objection which militated against the earlier steel castings was their want of homogeneousness. Hard spots were of frequent occurrence, surrounded by softer material. These spots appeared as lumps when the casting was turned or planed, and made it impossible to keep an edge on the cutting tool. But these objections are fast becoming things of the past. It is now possible, and is a matter of every day practice, to get castings made of a material which is soft, strong, tough and free from blowholes, which can be hammered cold or hot, which welds easily, and, in fact, which behaves in every way like superior wrought iron, with this difference, that it is very much stronger than wrought iron. It may appear strange that a simple casting should possess toughness equal or greater than iron which has been wrought; but it has been found by experiments that the properties of a piece of steel (free from blowholes) depend entirely on its chemical composition and its molecular condition, and not on the manner in which that condition has been induced, so that if different means can be found to produce similar conditions in steel, the final result is not affected by the method employed. For castings such means are found in annealing and tempering, the effects of which will be noticed later on. The difficulty encountered in the early attempts to make castings of Siemens-Martin or Bessemer metal was the formation of blowholes. This fault is entirely remedied by the use of a silicide of iron and manganese. The presence of a trace of silicon is found to have the singular effect of preventing that violent evolution of gas from fluid steel at the moment of solidification, which caused the objectionable unsoundness. The metal when run into the mould remains perfectly quiet, and a sound casting is readily obtained, possessing a smooth skin and sharp edges.

A principal characteristic of this metal is its extreme toughness. In one sense this toughness is a drawback—it renders the work of taking off the gates and runners of extreme difficulty. It is of no use to attempt to 'nick' them round and break them off. The breaking strain varies according to the nature of the casting and the subsequent treatment. Plain castings of some size may be made of very soft metal, while more intricate ones require to be made rather harder, but in no case is the metal really 'hard,' that is, too hard for tooling. In general, the variation does not exceed 6 tons per square inch. The extension varies from 36 to 12 per cent. in lengths of two inches, and from about 17 to 6 per cent. in lengths of eight inches parallel. The stronger qualities can be made, but any increase in strength is gained at the expense of toughness. The elastic limit has been invariably found to range from $\frac{1}{2}$ to $\frac{2}{3}$ the breaking strain.

The ultimate character of the steel depends much on the treatment to which it is subjected after being cast. The practice of long-continued annealing and heating in contact with oxides of iron, often adopted in connection with crucible steel castings, are not referred to, but simply the effects of heating and cooling in different ways. Of three samples of steel taken from the same casting, the first, which exhibited a largely crystalline fracture, showed the steel simply as it was cast; the second, which was much more compact in appearance, had been heated to a cherry red and cooled gradually; the third, which had a very close texture, had (after annealing) been again heated to a cherry red and cooled in oil. Beginning with the casting in its original state, the effect of reheating and cooling gradually is to greatly increase the toughness and the extension, to increase a little the breaking strain (except in very soft metals, in the case of which it is not much changed), and to decrease a little the proportion which the elastic limit bears to the breaking strain. By reheating and dipping in oil the breaking strain and elasticity are increased, the toughness and extension are diminished, and the metal is compacted. It will be noticed that the effect of dipping in oil appears to be analogous to that of hammering; much the same changes are induced. Of two bars 1 inch square, cut from the same casting, one was annealed simply, the other was annealed and dipped in oil. They were tested transversely with 3 foot bearings. The annealed one took its first permanent set with a load of 0.4 ton applied midway between the supports, and finally sunk with a load of 0.7 ton. It had been bent through considerably more than a right angle, and was not broken. The one dipped in oil took its first permanent set with a load of 0.5 ton and sunk when loaded with 0.9 ton, breaking when bent through 90 degrees. These bending tests corroborate the results of many tensile tests with regard to the increase of strength and decrease of toughness due to cooling in oil.

The art of steel founding is now so perfected that it is scarcely too much to say that anything which can be cast in cast iron can be cast in steel. The applications of steel are already almost innumerable. From it are made crank shafts, thrust shafts, connecting rods, eccentric rods, crossheads, guides, propeller blades and bosses, and even the nuts for them, gearing of all descriptions—the toothed wheels already cast ranging from a few pounds to as much as 12 tons in weight—carriage and wagon wheels, locomotive bogie centers, rolls and rolling mill gear, anchors, hydraulic cylinders, steam hammer faces and anvil blocks, and so on. It is seldom that a working stress of more than one ton per square inch is allowed to be put on cast iron. Hydraulic riveters, constructed of steel, are in daily and satisfactory use under a working stress of 14 tons per square inch. Here, then, is a material which can be molded to any shape as readily as cast iron, and which is stronger and tougher than wrought iron. Moreover, like wrought iron, it can be wrought under the hammer and welds with facility. It is almost unnecessary to point out the advantages which accrue from the possession of such a metal. The simple process of casting will in numerous cases displace the more difficult method of forging. In cases, also, where the engineer is tied to weight—as often instanced in marine engines—it is evident that the use of a material which is at least six or seven times stronger and more reliable than cast iron offers one means of securing lightness without the sacrifice of strength.

In conclusion, one or two examples of the relative durability of cast iron and steel may be given. A cast iron worm in connection with the turning gear of a steam crane in a foundry was ground away in three days. The steel worm by which it was replaced lasted eight or nine months. A driving pinion in a rail mill when of cast iron usually gave way in from one to three weeks, and failed through breakage of the teeth. A steel pinion, made to replace one of these, was taken out at the end of two years' continuous work, and then only because the teeth were so much worn that they did not gear properly. Steel is invaluable in rolls which are much cut into by the sections they are used for. In plain rolls the surface lasts well. The method of chilling is not used, but the hardness can be increased by increasing the carbon. It should, perhaps, be mentioned that the shrinkage of steel castings is about $\frac{1}{4}$ inch per foot."

The paper manufacturers doing business in the West, purpose forming a permanent association. There are now two separate associations, the Northwestern and the Ohio Valley. The object of the proposed consolidation is for mutual benefit and protection only. Should the consolidation take place one price will be charged all over the West, but it will not be higher than it now is unless the price of material should rise.

The total value of the exports of breadstuffs for March amounted to $12,404,735, and for the nine months ended March 31 to $147,701,367 as against $204,729,787 in the previous corresponding period.

SCIENCE AND INVENTION.

ELECTRIC LIGHTING OF RAILROAD CARS.—Charles E. Buell, of New Haven, has recently been awarded letters patent for devices for so controlling electrical storage as to overcome the difficulties encountered by the electrical engineers of Europe, and make the lighting of not only railway trains, but isolated residences and thickly settled communities practicable. He thinks a dynamo-electrical machine of two horse-power amply sufficient for lighting the longest railway train by stored energy, and that such machines can be supplied for less that $200 each. He is having an improved form of dynamo machine built at the factory of James Buell & Son, Woburn, Mass., which he thinks will produce a current equal to that produced by 600 cells of the Grove battery, when propelled by a two horse-power motor. His system for railway trains requires no attendance or skill in connecting, in turning on or off, and requires no replenishing of material consumed.

A NOVELTY IN GRATE BARS.—A novelty in grate bars consists of sections of bars of straight rolled steel, or wrought metal, between which are spacing washers, the upper and lower edges of which lie flush with the upper and lower faces of the bars. Bolts passing through the series of sections and washers secure the completed article. By this means a grate is cut without waste from a straight-rolled piece of metal.

A NEW PULLEY BAND.—A new pulley-band for driving machinery consists of an elastic cord surrounded with metallic rings or spirals. The spiral wire serves to protect the elastic cord from abrasion or wear, which would otherwise be very great on cords of this description.

CLEANER FOR STEAM BOILERS.—A recent invention in cleaners for steam boilers consists of a "mud or scum-pipe" provided on its upper side, at intervals of about one foot, with horizontally arranged scum-collecting cups of flaring shape, communicating with the pipe. The pipe is journaled at either end in the boiler-heads, and is capable of being reciprocated longitudinally in hollow plugs inserted in said boiler-heads, and which construction also admits of lengthwise expansion of the pipe. This pipe and its scum-collecting cups are arranged along the water-line in the boiler, and serves to catch any foreign matter on the surface of the water and convey it out from the boiler, a suitable discharge pipe connecting with the device serving the purpose of drawing such matter off.

AN ELECTRIC REGULATOR.—One of the chief defects in the arc electric light is the slight unsteadiness arising from imperfect regulation of the carbons. M. Salignac, one of the most active electricians of Paris, has discovered a new regulator which was to be one of the curiosities of the *grande soiree* to be given. Each of the two carbons is supplied with a parallel rod of glass, to which it is attached in a solid manner. These two rods being placed horizontally, are pushed by a spring, and the spark is lighted between them. But between the two glass rods there is a glass stopper which is warmed by the light in such proportion that the rods yield gradually to the pressure of the springs, and the carbons can approach each other, as is required for the constancy of illumination. A correspondent of *Nature* who witnessed some preliminary experiments states that they were a wonderful success.

THE ELECTRIC CONDUCTIVITY OF PHOSPHOR BRONZE.—H Vivarez, of Paris, has made a very elaborate series of experiments on the electric conductivity of phosphor-bronze wire, from which it appears that its conductivity is two and a half times that of iron and steel, and one third that of copper. As its strength is equal to that of steel, about 63 tons per square inch, it is recommended for telephone wires, for which purpose it is largely used in the United States.

A NEW METHOD OF HARDENING STEEL.—According to a "note" presented by M. Dumas at a meeting of the French Academy of Sciences, M. Clemandeau has discovered a new method of hardening steel which M. Dumas considers a very important one. He takes a bar of steel, beats it to a cherry red, inclose in a casing which it fills exactly, and submits to sudden great hydraulic pressure. It is allowed to cool under pressure, and is then found to be hardened and strongly magnetic. Magnets thus prepared are now used for telephones.

THE Quincy (copper) mine realized from its mining operations last year $1,038.457, while its expenses were $572.018, which, deducted from gross earnings, leaves net mining profit $466,439. It paid in dividends $11 per share, $440.000

NEARLY 200,000 tons of spiegeleisen and ferro-manganese are used yearly in this country in the manufacture of Bessemer and open-hearth steel, most of which is imported from abroad. In the light of these facts, is it not worth while to follow up, with explorations, the manganiferous iron ore indications that exist in Marquette and Baraga counties, and see if it is not possible to supply this valuable alloy up here instead of sending across the water for it?—*Houghton Mining Gazette.*

MARKETS.

FINANCIAL.

Office of TRADE REVIEW AND WESTERN MACHINIST.

FRIDAY EVENING, April 21.

The money market is steady, the bank rate of discount being 7 to 8 per cent. Good business paper is in full supply, and there is a fair demand for money. Call loans rule at 6 per cent. Manufacturing paper is scarce.

IRON.

There is a feeling of uncertainty in the market as to the course of prices which tends to limit transactions. Sales of American pig have taken place in small lots at our quotations, but in larger transactions prices have been shaded. The steel rail market is still reported quiet, and the same is true of track supplies, although the mills are all well supplied with orders; the rail mills are all sold several months ahead. Muck Bar continues very dull, and, as compared with the highest point, prices are off from $3 50 to $4 per ton; may be quoted at $42. There is a better inquiry for old rails. A large consumption of construction iron is going on owing to the extent of building operations.

CINCINNATI--(Reported by Rogers, Brown & Co.) There is little change to report in the situation. Buying goes on steadily, but in a small way, to meet daily requirements. The policy of holding aloof, which buyers have now pursued for six weeks, is reducing stocks in foundry and mill yards to a slender limit. This course will be pursued, undoubtedly, until the proper influences arrest the decline and harden prices a little, when a rush of buyers will send values rapidly upward again The experience has been so often repeated in this market that it has become tolerably familiar. One important furnace in the South (Sloss), has blown in during the week, but this is more than counterbalanced by several in the Hocking Valley and Hanging Rock region (as, for example, "Sarah," "Baird," "XX," "Moxahala," &c.) which have recently gone out of blast. Many of the Hanging Rock Charcoal furnaces are out, making their usual preparations for the coming season's blast. Freight rates from Tennessee and Alabama furnaces to all northern points are advanced about ten cents per ton for the quarter beginning April 15th. The quotations below are carefully revised to meet the actual conditions of the market. We quote for four months. Hot Blast Foundry, Hanging Rock, C.C., No. 1, $28 00@$29.50; No. 2, $27.00@$28 50; Southern, No. 1, $27 00@28.00; Strong Coke, No. 1, $26.50@27.50; No. 2, $2 .00@26 00; No. 3, $24.00@25.00; Soft stone coal No. 1, $24 50@26.50; No. 2, $23.50@$24.50. Forge--Strong, Neutral, No. 1 Mill, strong, $23.00@$24.00; Cold Short, No 1 Mill $22.00@23.50. Car Wheel and Malleable Hanging Rock Cold Blast, $35@37; Hanging Rock Warm Blast, $28@29; Southern Car Wheel Iron $35@37; Lake Superior, $32@34; Lake Superior Malleable, $32@$34.

CINCINNATI—Reported by E. L. Harper & Co.—The market has ruled quiet throughout the week. Consumers have purchased for actual necessities only, some large buyers being in the market making small purchases. The furnacemen on the other hand are not urging sales, being in the main able to bear the pressure, buoyed with a hope of an early recovery of the shrinkages already suffered. The best brands and grades are the last to feel the effects of a dull season, there always being a demand, and barring some car wheel irons, there is little change in these leaders, while the prices on obscure brands and off lots are merely nominal.

COPPER.

It is believed that there is going to be a better demand for copper this year than ever. The factories which are making the electric wire cannot supply the demand, and it is entering into various new uses. Copper rolling mills, too, are crowded with business, for copper boilers, bottoms, &c. In spite of this, there are large consumers who look for lower rates. In the uncertain state of the market there are no buyers of futures. Transactions the past week have been moderate We quote Lake Copper 18c@18¼c; Arizona, refined, 18c@18¼c., and Baltimore at 18c.

LEAD.

The market for lead rules dull, and the jobbing sales reported have been at 5.05 to 5.10 cent. Consumers do not buy beyond current requirements, awaiting the result of coming supplies.

TIN.

The dullness of the London market for tin reacts upon prices here; transactions have been moderate and sales effected for 24¼c@24¾c. For tin plates the consumptive demand is good, but the general impression of the possibility of a decline restricts purchases.

SPELTER AND ZINC.

Domestic brands are obtainable at 5 3-4 cents and Silesian at 5½ cents to 5⅝ cents, and even less for parcels to arrive or from dock. Domestic and foreign sheet zinc from store is quoted 7¾ to 7⅞ cents.

COAL.

Heavy sales of coal for shipment have taken place the past week, the attitude of the miners who are opposed to late reductions in their wages, stimulating purchases. Freights continue low. See our price list for quotations. We quote for general charters Lake Michigan, 75c.; Detroit River ports, 40c.; Lake Superior, Marquette, Houghton, &c., 60@70c; Duluth $1. The retail trade is somewhat dull.

HARDWARE.

The tone of the market is strong, and the week has been characterized by a fair amount of business We have to record few changes in values. Mills are running full time, and manufacturers endeavor to fill orders more promptly. The requirements of users of edge-tools cannot be fully met, and jobbers have an insufficient supply of builder's hardware. Sales of barb wire are on an increasing scale. The manufacturers of bench and molding planes have advanced their prices, and now quote first quality bench planes discount 20 per cent.; second quality ditto 25 per cent.; molding planes, discount 15 per cent. In nails there is a fair and increasing business at card rates; $3.40, sixty days, with an abatement of 10 cents per keg on carload lots and upward and two per cent off for cash. For wrought iron pipe the demand is increasing as the season progresses.

LUMBER.

All the signs indicate that there will be a large business the coming season. Building operations in Northern Ohio are being carried out on an active demand

WOOL.

Steubenville within a short time has disposed of 500,000 lbs. of wool, chiefly at 40 cents, and it is believed that little more remains among Ohio growers. In the eastern markets there have been large sales of domestic wool. Lots of No. 1 Ohio have commanded 45c. and X Ohio 44@48c.

LUMBER.

PLANK, MIXED WIDTHS.
2 inch, 12, 14 and 16 feet, together.

A 1 and 2	$50
A 3	40
B	32
C	22
D	16
E	13

1¼ and 1½ inch.

A 1 and 2	$48
A 3	40
B select	32
C	22
D	16
E	13

BOARDS.
One Inch, mixed widths.

A 1 and 2 uppers	$44
A 3	36
B select	30
C	22
D	16
E	13

STOCK BOARDS.
12 Inches wide.

A 1 and 2	$45
A 3	38
B	32
C	24
D	16

STRIPS.
6 Inches wide.

A 1 and 2	$42
B	35
C	25
D	18
E	14
Norway Fencing Strips	18
Norway Flooring Strips	25

WORKED LUMBER
FLOORING.

Flooring—A 3	$42
B	38
C	24
D	20
Norway Flooring—A 3	28
C	22
D	18
Matched Drop Siding, 6 inches—A 3	42
B	38
C	24
D	20

Beaded Ceiling $2 higher than Flooring.

One half inch Bevel Siding—A 1 and 2	24
A 3	20
B	18
Ash Flooring—A 1 and 2	40

BILL STUFF.

Small, joists, 12, 14 and 16 feet	$16
18 feet and under	$17

Timber, larger than 8x8 special.
Long timber, longer than 18 feet, adds about $1 per foot per M. to the price of short.

Cedar Posts, large	30 00
" " medium	25 00
" " small	$15 to 20 00

SHINGLES, LATH AND MILL WORK

Shingles XXX	$4 50
Clear Butts	3 50
Lath	3 00

Surfacing, one side, adds $1.50; two sides $2.
Matching flooring and drop siding, $2 50.

FOR SALE.

One 15-H.P., mounted Threshing Machine.
One 10-H. P. Threshing Machine.
One 8-Horse Power.

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Group of developed and producing gold and silver mines in District of Chapatuato.
Group of developed and producing silver mines in district of Ozumatlan.
Group of undeveloped, working gold mines in district of Sinda.
Group of gold prospects in the district of Tiquio.

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Heavy Punch or Shears

Used for punching Railroad Fish Plates. Punches four holes at a time. Weight over Five tons. Good as new. Address
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Special rates to Dealers. Prices made at all points on Railroads. Telephone No. 1067.

Cleveland Wholesale Prices.

HARDWARE.

Adzes.

Carpenter's	per doz	$16 80
Ship	" "	18 75
Heavy railroad	" "	19 50

Axes.

Hunt's	₱ doz	$ 9 50
Lippincott's Crown	₱ doz	9 00
Cut More	₱ doz	9 00
Peck's Double Bit	₱ doz	22 00
" Champion Blade	₱ doz	11 00

Anvils.

Eagle, Amer.	per lb. 10c dis 15
Wright's	11½c@12c
Armitage's Mouse Hole	9½@9¾c
Trenton	10½c
Wilkinson's	10c

Animal Pokes.

Berea, per doz	4 00
Eagle, per doz	5 00

Apple Parers.

Domestic & Reading	₱ doz $7 50
Turn Table	00

Cleveland Stamped Elbows
Genuine Russia Iron

4 inch per doz	4 50
4½ do do	5 50
5 do do	7 50
5½ do do	8 50
6 do do	9 50
7 do do	11 00

Planished American Russia Iron

4 inch, per doz	4 00
4½ do do	5 00
5 do do	6 50
5½ do do	7 50
6 do do	8 50
7 do do	9 50

Charcoal Iron

4 inch, per doz	2 00
¼ do do	2 50
5 do do	3 50
5½ do do	4 00
6 do do	4 50
7 do do	5 50

25 per cent

Augurs and Bits. Dis

C S cut augurs	40@10
do do do bits	40@10
D C gimlet do	$6.00 Gross
Snells	@40
Russell Jennings'	10 10@10
Cook's pat augur	40@10&50
Post hole, net ₱ doz	$21@24

Balances. Dis

Stillson's, Frary's, Morton's	15
10 per ct	

Bellows. Dis

Blacksmith's com new list, 40 ₱ct	
Moulder's new list, dis 40 ₱ cent	
Hand, new list, 40 per cent	

Bolts. Dis

Carriage and tire, com	80
do do Norway	65
Stove	40
Plow	30
Wagon	40
Machine & Square head	55
Skein	55
Bolt ends	55
Lag	55
Tap	55

Butts. Dis

Wrought brass	65&10
Cast, loose joint	50&10
Pin, Japanned and silver tipped	45&10
Wrought, fast joint narrow	40&10
Wrought fast joint broad	45&10
Wrought loose joint broad	45&10
Wrought table and back flaps	40&10
Loose joint, reversible	45&10
Brass kettles—per lb	32@35

Chains.

Coil by cask,

3-16	¼	5-16	⅜	7-16	½
10¼	9	8	7	6½	6¼

Crucibles.

Per number	4@ 4½

Clothes Wringers

Keystone per doz	42@45

Chisels.

Hot and cold cutting	₱ lb. $ 30
Railroad track	30
Machinists	30
Chipping, mallet head	50
Cape	50
Packing	50
Stone cutters	50

Crowbars.

Steel point	₱ lb $ 5
Solid steel	8

Drawing Knives.
Discount.

Witherby's	60@10 ₱ cent
Barton's	15
Adjustable handle	10

Emery.

Genuine Chester	7@ 8
Wellington	10@12

Files.

Auburn	$5 to £ dis 35 pr cent
E. M. Boynton's, new list	dis 25
J. & Riley Carr	4.50 to £
Johnson & Bro.	dis 30
Butcher's	4.50 to £
Walter Spencer & Co.'s "Diamond"	4.50 to £
Fisher's	4.75 to £
Moss & Gamble	4.50 to £
H. Disston & Sons (new list)	dis 40 per cent
Heller Bros.' Horse Rasps	dis 25
Nicholson	dis 40
New American	dis 40
Union File Co	dis 0

Horse Rasps.

Heller's	dis per cent 30
"Arcade"	50 & 20

Harrow Teeth.

Iron ⅝ to 1 inch	per lb 3¾c
Steel, square	4¾c

Hammers.

Mason's stone hammers, steel faced and pene	₱ lb 15
Mason's stone hammers, solid cast steel	25
B. S. Napping hammers	30
Striking hammers, solid cast steel, 5 to 25 lb	20
Drilling hammers, solid cast steel, 3 to 6 lb	20
Turning hammers, full polished	each 2 00
Set hammers	₱ lb 35
Creasing hammers	35
Ordinary bush hammers	55

Nails.

BRADS AND FENCE.

10 to 60d	3 40
8 and 9d advance	25
6 and 7d do	50
4 and 5d	75
3d	1 50
2d	2 75
3d fine	3 00
2d fine	3 75
⅝ inch	3 00
4d barrel	1 00
1¼ inch barrel nails	1 50
1½ do do do	1 75
1 do do do	2 50
⅞ do do do	3 00
Cut spikes, all sizes	25
Clinch nails, all sizes	1 75
Casing and box nails 75 cts advance	
Finishing nails, $1 25 do	
Tobacco nails, 50 cts do	

Nuts and Washers

	Dis
Nuts	7
Washers	6

Picks.

Railroad, 4 to 5 lbs	doz $7 75
5 to 6 lbs	7 75
to 7 lbs	8 50
7 to 8 lbs	9 50
Railroad Tamping Pick	7 to 8 lbs. doz 13 50
Mill Picks per lb	75c

Rivets.

Iron	dis 40
Tinned	dis 40
Copper	dis 33⅓

Squares. Dis

Steel or iron, case lots	50
Try squares and T bevels	40

Spikes—WROUGHT

All lengths by ¼ inch	4¼c
do do do 5-16	3¾
do do do ⅜, 7-16 & ½ in	3¼

Shovels and Spades.

Ames' new list, July 1, 1881	dis 15
Old Colony	dis 15
Remington's (Lowman's Patent)	dis 30
Rowland's	dis 40 and 10
Griffiths	dis 40&10

Shovels and Tongs.

Iron and Brass Head, R. & E. list	dis 60&2
Polished Steel, new list	dis 50&10&2

Sad Irons.

From 4 to 10 lbs.	per lb 3¾ net
Self-Heating	₱ doz $9 net
" Tailors	₱ doz $18 net
Gleason's Shield and Toilet	dis 25
Mrs. Pott's Irons, double pointed	dis 40
Mrs. Pott's Irons, square back	45 dis
Enterprise Star Irons	45 dis
Comoined Fluter and Sad Iron	₱ doz $15, dis 15

Saw Sets.

Boynton s patent X Cut, per doz $12; Hand Saw, per doz $10	dis 20
Stillman's Genuine, per doz $3 50 and $5 50	dis 20
Stillman's Imitation, per doz $3 25	dis 20&10
Common Lever, per doz $2	dis 30&10
Leach's No. 0 $8; No. 1 $15;	dis 15
Hammer, Hotchkiss $5 50, dis 10	
" Bemis & Call Co.'s new patent	dis 40&5
Bemis & Call Co.'s Lever and Spring Hammer	dis 30&5
Bemis & Call Co.'s Plate	dis 10
" " Cross-cut	dis 12½
Aiken's Genuine	$13, dis 50&10
" Imitation	$7, dis 50
Hart's Patent Lever	dis 20
Disston's Circular	dis 40

Scales. Dis

Fairbanks'	25

Screws. Dis

Flat head iron or steel per cent dis	30
Flat head brass	30
Round head iron or steel	25
Round head brass	20
Coach or lag	55 ₱ct

Tank Iron.

3-16, ¼ and ⅝ inch thick	3 20

Tacks. Dis

Black	80—10
Tin'd	55—10

Traps. Dis

New House	30
Peck, Stow & Co	50—10

Vises.

Solid box, Dis	40

Wrenches.

Coe's genuine	40 & 10
Coe's imitation wrought bar	0
Mechanics'	60 and 10

Bag Holders.

Sprengle's Pat, $18.00 per doz 40 per cent. dis.	

Planes.

Ohio Tool Co	dis 20
Sciota	dis 25
Bailey's Pat. Adjustable	dis 25

Rules.

Stanley	dis 66⅔ and 10

Sash Locks. Discount.

Payson Mnfg. Co. "Perfect"	42
Simmons' Sash Supporters	20

Hinges.

Champion double acting spring hinges	dis. 30
Screw & Strap 8@12 in.	$6. net
Gravity Locking Blind Hinges, Sargeant & Co.	70&10

Wire.

Brass and Copper	dis 20
Bright & annealed, Nos. 0 @ 18	dis 50@52½
" " Nos. 19@26	dis 60
" " Nos. 27@36	dis 65
Coppered Nos. 0 @ 18,	dis 45
Galvanized, Nos. 0 @ 18, market list,	dis 40@45
Tinned, Nos. 0 @ 18,	dis 40@45
Cast steel	dis 40
Tinned Broom Wire, Nos. 18@25	dis 55
Annealed Fence, Nos. 8 and 9	dis 55@52½
Annealed Grape, Nos. 10 to 14	dis 52½
Galvanized Telegraph, Nos. 7 to 9	₱ lb 7¼c
Galvanized Telegraph, Nos. 10 to 11	₱ lb 8¼c
Galvanized Telegraph, No 12	₱ lb 10½c
Fence staples	₱ lb 5½@5¾c
Fence Staples, galvanized,	₱ lb 7@7¼c
Stubs Steel Wire	$7 00 to £
Barb Wire, painted	8½c
Barb Wire, galvanized	9¼c
Crucible Steel Ropes from ¾ in. at 9c to 1¼ in. at	52c
Best Selected Iron Ropes from 3-16 in. at 3c. to 1¼ in. at	33c

Gas and Steam Fitters' and Machinists' Supplies.

Gas and Steam Pipe—See Pipe Wrought.	
Enameled Pipe	dis 65
Artesian Well Casing	net list
Hydraulic Tubes	net list
Malleable Iron Fittings	net list
Cast Iron Fittings	dis. 55
Globe Valves	dis. 50
Angle Valves	dis 45
Check Valves	dis. 45
Safety Valves	dis 45
Eddy Gate Valves	dis. 20
Steam Cocks	dis 45
Service Cocks	dis. 45
Ball Gauge Cocks (net per dozen)	$15
Compression Gauge Cocks	dis. 45
Miss. Gauge Cocks	dis. 45
Register Gauge Cocks (net per dozen)	$15
Cylinder Cocks	dis. 45
Air Cocks (net per dozen)	$2 75
Oil Cups	dis. 45
Steam Gauges	dis. 35
Water Gauges	dis. 45
Scotch Glass Tubes	dis. 60
Steam Whistles	dis. 45
Iron Body Globe Valves	dis. 55
Iron Body Safety Valves	dis. 55
Iron Body Steam Cocks	dis. 55
Pipe Tools	special
Globe, Angle and Check Valves (Powell's regrinding)	dis. 45
Guarantee "Jet Pumps"	dis 40
Mack's Injectors	dis. 25

Boiler Plates.

("Gaylord"—Standard Quality.)

C. No. 1	4 50
C H. No. 1 Sheil	4 60
C. H. No. 1, 50,000	5 00
C. H. No. 1, 55,000	5 50
C. H. No. 1 Flange	6 00
Firebox	
T. S., 60,000 (as per)	6 00
T. S., 65,000 (act of)	
Homo. Steel, 70,000 (of Cong)	8 00

Heads, ¼c ₱ lb extra.

N.B.—Eastern brands of boiler plate at from 2-10 to 3-10c ₱ lb less than above prices.

Boiler Rivets—"Albany."

⅛, ¼, 11-16, and ¾ in. diam.	5 50

Sheet and Tank Rivets.
"Norway."

All sizes	dis. 15

Nuts, Bolts, etc.

Square & Hex. Nuts	7 off list
Washers	6 off list
Machine Bolts	dis 55
Bolt Ends	dis 55
Boiler Patch Bolts	net list

Boiler Tubes.

"National" Standard Gauge 1 inch to 10 inch	dis 37½
"National" Standard Gauge 11 inch to 15 inch	dis 25
"National" Special Locomotive Tubes	net list

Boiler Makers' Tools.

Doty's Power Shears	net list
" Hand Lever Shears	net list
" Power Punch	net list
" Hand Punch	net list
Steel Screw Punch	net list
Iron Screw Punch	net list
Boiler Plate Rolls	net list
Buffalo Forges & Blowers	dis 20
Watson's " "	net list
Spring Tube Expander	dis 15
Roller Tube Expander	net list
National Tube Cleaner	dis 20
Wire Flue Brushes	net list
Anvils—"Peter Wright"	12½ ₱ lb
Solid Box Vises	net list

IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch	2 70
4½ to 6 by ⅜ to 1 inch	2 80
1¾ to 6 by 1¼ to 1½ inch	3 15
1¼ & 1¾ by ¾ to ¾	2 80
1 & 1¼ by ⅜ to ¾	2 90
⅛ ¼ and ⅜ by ⅜ to ¾	3 15

Round,

1 to 1⅜ inch	2 70
2 to 2¾	2 90
2¾ to 3¼	3 20
3¾ to 4	3 70
4¼ to 4½	4 20
4¾ to 5	4 40

Square.

1 to 1⅜ inch	2 70
2 to 2¾	2 90
2¾ to 3¼	3 20
3¾ to 4	3 70
¾ to ⅞	2 80

Heavy Band.

1¾ to 6 by ¼ and 5-16 inch	2 90
1 to 1¾ by ¼ and 5-16 do	2 95
¾ to ⅞ by ¼ and 5-16 do	3 00
⅝ to ¾ by ¼ and 5-16 do	3 80

Half Oval and Half Round.

Wagon box iron ¾ and ⅞	3 95

1-10c per lb extra will be charged for cutting to specified lengths

Light Band.

1¼ to 2¾ by ⅛ to 3-16	3 25

Hoops.

1¼ to 2 , Nos 16 to 18	3 90
2¼ to 3½ do 13 to 15	3 90

1-10 extra for each gauge lighter

Sheet Iron.

No 22 to 24	4 50
No 25 to 26	4 30 offd. 4 50 asked
No 27	4 90
No 28	4 85

English Steel.

Best cast	₱ lb 15½c
Extra cast	16½c
Round machinery, cast	14c
Swaged, cast	18c
Best double shear	15½c
Blister, 1st quality	13c
Refined tool steel	16½c
Spring calking	7¼@7½c
German steel, best	11c
2d quality	10c
3d quality	9c
Sheet cast steel, 1st quality	15½c
2d quality	14½c
3d quality	12½c

American Steel.

Best brands of refined cast steel	12c
Crucible machinery	8c
Open-hearth ditto	5c
Hammer cast steel	9½c
Spring cast steel	7½c
Bessemer and open-hearth spring	5½c
Ditto plow	5½c
Steel boiler plate	6½@7c
Bessemer mach nery	5 @6c
Spring and calking	7¼@7½c
Tire	4 @4¼c
Sleigh shoes	3½@3¾c

Bessemer Steel Tire.

⅝ to 1 by 3-32	4½ ₱ lb
⅝ to 1 by ¼ to 5-32	4½ ₱ lb
⅝ to 1 by 3-16 to ¼	4½ ₱ lb

Miscellaneous Cast Steel.

Auger and auger bit	
Axle steel for wagons	
Frog points and plates	
Frog size bars	-¼
Pick, plain	8¼
Pick, and Mattock, beveled	8 ¼
Skate steel	8¼
Table cutlery	8 ¼
Trap spring steel	9
Pike and cant hook	8½
Coal and granite wedge	8½

TINNER'S STOCK.

Tin Plate,

10x14 IC	charcoal	$6 25
do IX	do	8 25
12x12 IC	do	6 00
do IX	do	8 50
14x20 IC	do	6 50
do IX	do	$6 25@7 50
DC, 12¼x17	do	6 00
DX 12¾x17	do	8 00

For each additional X add 2 00

IC 10x14	coke	$5 75@5 50
IC 14x20		
IC 12x12	do	6 00@5 75

Tin.

Banca	per lb.	28c
Straits	"	26c
English	"	25c
Spot Tin	"	25c

Solder.

½ and ½	16½c
Extra	15½c
No. 1	13½c

Pat Planished Sheet Iron.

[A]	per lb 10½c
[B]	9½c

Nos	10	15	21	25
to	14	20	24 & 26	
Com	3-60	3-80	4-00	4-20
Char	5-60	5-80	6-00	6-20

Sheets over 28 in. wide ¼c extra

Sheet Iron.

Galvanized, No	10 to 20	₱ lb	8¼a7¼
do	do 22 to 24	9	a8
do	do 25 to 26	10	a8½
do	do 27	10¾	a9
do	do 28	11¾	a9½

dis, 40

Russia Iron	12½@12c
American Cold Rolled	6@7½

Zinc.

Sheet, cask	7½@ 7½
Sheet, open	8@ 8½

Tinners' Tools & Machines.

Machines (P. S. & W.)	list add 20
Tools (P. S. & W.)	add 6

LEAD.

American, ₱ lb	5½c
Bar, ₱ lb	6¼c net
Pipe, ₱ lb	7½c dis 10 per ct
Sheet, ₱ lb	8c dis 10 per ct
Tin-lined pipe ₱ lb	15c dis 10 pr ct
Shot Drop 7c; Buck	8c
Chilled Shot	8c

COPPER.

Lake Ingot	18@18¼c
Baltimore	18c
Arizona	18@18¼c

Sheathing Braziers Copper, Bolts, &c.

Brazier's Copper, ordinary sizes, 16 oz. per sq. foot, and over per lb	30c
Brazier's Copper, ordinary sizes, under 16 oz. and over 12 oz. per sq foot, per lb.	32c
Brazier's Copper, 10 oz. and 12 oz per sq ft. per lb.	34c
Brazier's Copper lighter than 10 oz per sq ft per lb	36c
Circles less than 84 inches in diameter per lb.	33c
Circles 84 inches in diameter and over per lb.	30c
Segment and Pattern sheets per lb	33c
Locomotive Fire Box sheets per lb	30c
Sheathing Copper, over 12 oz per sq ft per lb.	28c
Bolt Copper per lb	30c
Copper Bottoms per lb	31@32c

No copper is Sheathing except 14x10 inches, and not to exceed 34 oz. to the sq ft

Tinning.

14x18 per sheet	6c

All other size sheets, 2½c per square foot For tinning both sides, double the above amount.

SCRAP IRON AND OLD METAL

DEALER'S SELLING PRICES.

	Net Tons.
No. 1 wrought scrap	$28@29
Sheet and hoop "	12@18
Cast scrap, (No. 1 heavy)	19@21
Cast Scrap (Stove Plate)	14@15

OLD METALS.

Old copper per lb	16
No. 1 H. Brass per lb	16
Heavy yellow Brass do	12
Light Brass per lb	10
Scrap Zinc per lb	@4
Tea Lead per lb	@4½
Heavy Lead per lb	4½@5

BRASS.

Cash prices for Roll and Sheet Brass For less quantity than 100 lbs. add 3c per lb

High Brass

All Nos not thinner than to No 28. wider than 2 in. not wider than 14 inch	30c
All Nos to No. 28, inclusive, and widths over 14 to 20 in. inclusive	35c
All Nos. to No 28, inclusive, and widths over 20 to 30 in. inclusive	38c

¼c per lb. advance on each No above Nos. 28 to 38, inclusive.

All Brass thinner than No. 8 is Platers' Brass at	53c

Sheets 24x48, and all sheets cut to particular sizes and lengths under 30 inches, in width wider than 2 inches 37c

Low Brass.

4c per lb. more than High Brass.

Gilding metal 8c per lb. more than High Brass	
Platers' or Gold Metal In Bars	48c
Sawed	51c
Planed or Polished	54c

For Slitting

Metal in width in. to ⅛ in. to No 28, inclusive, 1c per lb advance	
Metal, in width 2 in. to 1 in, thinner than No. 28, 2c per lb. advance.	
Metal, in width ⅛ in. to ¼ in. thinner than No. 28, 5c per lb advance.	
Metal ¼ in in width and less, 10c per lb advance.	

Any of the above widths cut to particular lengths, add 7c per pound.

PIPE, WROUGHT.

Standard Wrought Iron Lap Welded Steam and Gas Pipe.

Inside Diameter. Inches.	Plain, Price Per Foot.	Galvan or Enameled Per Foot.	Outside Diameter Inches.	Weight Per Foot.
⅛	08		.40	.24
¼	08	$0 11	.54	.42
⅜	09	12	.67	.56
½	11	15	.84	.85
¾	13½	19	1.05	1.13
1	19	26	1.31	1 67
1¼	27	40	1.66	2.26
1½	33	47	1.90	2 69
2	46	64	2.37	3.66
2½	75	1 00	2.87	5.77
3	95	1 30	3.50	7 55
3½	1 25	1 70	4 00	9 05
4	1 50	2 05	4.50	10 73
4½	1 75	2 40	5. 0	12.49
5	2 25	3 00	5.56	14.56
6	2 75	4 00	6.62	18.76
7	3 75	....	7.62	28.00
8	4 75	....	8.62	28.00
9	6 50	....	9 68	34 40
10	8 00	....	10 75	40.64
12	12 00	....		54.65

Discount, plain, 55 per cent; galvanized, 52½ per cent.

Babbitt Metal.

N. P. U.	₱ lb @9c

A. 28c., B. 25c., C. 15c.

COAL,

WHOLESALE.

Wholesale f. o b vessel at Cleveland:	
Carbon Hill and Monday Creek	$2 65
Massillon	2 85
Brier Hill	3 50@3 75
Pittsburgh	3 00
Salineville	2 50
Tuscarawas	2 25

RETAIL.—Delivered.

Massillon Lump	$4 00
" Nut	3 75
Carbon Hill and Monday Creek, lump	3 75
Carbon Hill and Monday Creek, nut	3 50

75c less on cars by car load.

Anthracite Stove and Chestnut	7 15
Egg and grate	6 00

Hides and Leather.

Prime cured hides,	7½@7¾
Green hides	6@6½
Buil, scrubby, badly scored or damaged, cured, two-thirds price.	
Prime dry hides	13@14
Horse hides, green	$1 75@2 00
Horse hides, dry	$2 00@2 25
Prime cured veal calf	12½
Prime Deacon Skins, salted	60c
Pelts, wool on	32@34
Fresh slaughter sheep	30@$1 50
Fresh slaughter lambs	50@60
Green calf skins	13
Hemlock rough	23@24
Oak rough	24@26
Oak sole	37@40
Union harness	32@35

GLASS.

(Per box of 50 feet)

SINGLE THICKNESS

6x8 to 10x15	7 50
11x14 to 15x24	8 50
16x24 to 20x28	9 75
15x34 to 24x30	10 75
26x28 to 24x36	11 50
26x36 to 26x44	13
26x46 to 30x50	14 00

DOUBLE THICKNESS

6x8 to 10x15	11 7
11x14 to 15x24	18 25
16x24 to 20x28	15 75
15x34 to 24x30	17 25
26x28 to 24x36	18 50
26x36 to 26x44	21 25
30x50	22 50
30x52 to 30x54	23 25
30x56 to 34x56	25 00
34x58 to 34x60	27 75
36x60 to 40x60	30 00

Dis 60 & 15 single, 60 & 20 double

PAINTS.

White Lead, Eng. oil	9	@9½
do American do	7	@7½
do do dry		@7¾
White Zinc F. oil	10	@11¼
do do dry	8	@10
do American. oil		@9
do do dry	5½	@6¼
Chinese blue	₱ lb 75	@80
Prussian do oil	do 45	@55
Ultramarine blue	do 18	@30
Celestial blue	do 8	@10
Paris green	do 25	@30
Chrome green	do 8	@14
Fr Crown green	do 16	@18
Eng Vermillion	do 55	@60
Am Vermilion	do 15	@22
Indian red dry	do 9	@12
Venecian red, Eng	do 1½	@ 2
Orange mineral	do 10	@14
Rose pink	do 10	@13
Red lead, Am	do	@ 7¼
Carmine No 40	₱ oz 60	@75
Umber burnt	₱ lb 4	@ 8
Sienna	do 4	@15
Vandyke brown	do 10	@12
Spanish brown	do	@ 1¼

OILS & AXLE GREASE

Pure Oils. packages included

Sperm, winter bleached per gal	@1 15
Elephant, winter bleached, per gal	@ 70
Whale, winter bleached per gal	60@ 65
Seal, winter bleached	80@ 85
Bank oil	48 @ 51
Straits	50 @ 53
"A" oil for tanner's use	35 @ 40
Lard oil extra W S	90 @ 95
do No 1 do	76 @ 79
do No 2 do	63 @ 66
Tallow oil	65 @ 72
Neatsfoot oil pure	1 05
do No 1	80
Linseed oil, raw	@ 60
Linseed oil boiled	63
Cotton seed oil white	64 @ 66
do do yellow	60 @ 63
Carbon oil Ohio legal test	9¼@11¼
West Virginia lubricating 28 deg	@ 29
Pure Mecca	55@ 50
Paraffine oil winter pressed gray 25	25@ 30
do do do	40
Machinery	50
Engine	40@45
Miners' oil	40
Drilling oil	

Compound Oils, (light color'd)

No 1 Sperm signal oil	65@ 68
No 2 do do	58@ 63
No 1 wool and spindle oil	40@ 50
Golden machinery oil	30@ 35
No 2 Mecca (dark colored)	20@ 30
Axle Grease (light colored per gross	7 50@ 8 00
Tallow, prime	8¾@8¾
Tallow, dark and No. 2	6½
Beeswax	0@

Cleveland Business Directory.

Assayers and Analytical Chemists.

JUDSON, W. E, Analytical Chemist, 8 Cushing Block.

Bolt and Nut Works.

HOTCHKISS & GAYLORD, manuf'rs. Machine, Plow & Elevator Bolts, Coach Screws.

Boiler Makers

SMITH & TEACHOUT—(Established 1857.) Boiler, Tanks, Stills etc. 439 Broadway.

B idge Builders.

BUCKEYE BRIDGE AND BOILER WORKS mfrs of Arch & Truss Bridges, Boiler Tanks and Oil Stills. Bet. Wasson St. and Case Ave.

Coal and Iron Exchange.

JACKSON IRON CO. Iron Ore and Pig Iron. Rooms 8 and 9. Fayette Brown, Gen. Agent.

RHODES & CO. Coal, Iron Ore an Pig Iron. Rooms 1 and 2.

Carriage Blacksmith.

STRIEBEL, CHAS. manfac'r. of Carriages and Wagons and platform trucks. Horse shoeing and general blacksmithing .93 Woodland ave.

Carriage Bolts.

THE COLWELL & COLLINS NORWAY BOLT CO., manufacturers of Philadelphia Carriage and Tire Bolts.

Church and School Furnture.

FAULHABER, GEO. manufacturer of School and Church Furniture. Fine Hard Wood work a specialty. 208 Ontario Street.

Custom Boots and Shoes.

ROONEY, JOHN manufacturer of hand-made Boots & Shoes, custom made and warranted 177 Ontario Street.

Carriage Repository.

GREENE'S, J. O., Carriage Repository, 408 Superior street and 52, 54 & 56 Rockwell street, dealer in Fine Carriages. Repair shop in connection.

SLATER, G. A., Carriage dealer, sells the best work for the lowest price. A fine assortment always on hand. Repository 365 Euclid Avenue

Coal and Pig Iron.

ANDREWS, HITCHCOCK & CO., Briar Hill Coal and Pig Iron. 122 Water Street.

Distillers.

BLOCH, S. H. & E., Distillers, and wholesale dealers in Kentucky Whiskies. 66 Water St.

Electrical,

ELECTRIC SUPPLY CO. manfrs and dealers in Electric Burglar Alarms, Annunciators, Cell Bells and Batteries. Telephone lines built and repaired. 145 Seneca Street.

Fresco Artists.

KEMMER & KUSHMAN DECORATIVE CO., Fresco Artists, Fine Modern Wall Papers. 239 Euclid ave.

Foundries.

BOWLER & CO., Car Wheels, Patent Chilled Frogs, and all kinds of castings. 9 Winter.

CLEVELAND MALLEABLE IRON CO., manufacturers Malleable Iron Castins.

LAKE SHORE FOUNDRY, Water and Gas Pipe, Light and Heavy Castings. Alabama st.

TAYLOR & BOGGIS, successors to H. & H. F. Taylor, Iron Founders, 65 to 73 Central Way.

VIADUCT FOUNDRY COM'Y, Aenis, Carlin & Strangward manfrs of Machinery Ca-tings Fine Light Castings a Specialty. Office & Works 11 13 15 and 17 Detroit Strert, near Center.

ECLIPSE IRON WORKS manufacture Casting of all kinds. Cor Center & Winslow Sts

FITZSIMONS WM. & SON, Rolling Mill and Machinery castings. Rolls a Specialty. No. 435 Broadway.

File and Saw Works.

PARKIN, W. H & CO., Hand-cut Files and Rasps, dealers in Disston's saws, 11 So. Water

Grindstones.

OHIO GRINDSTONE CO. manufacturers of and dealers in Grindstones. 127 Superior st.

Hotels.

FOREST CITY HOUSE, cor. Public Square and Superior st., Terrill & Ingersoll, Props.

KENNARD HOUSE, D. McClasky, Prop.

NEW ENGLAND HOTEL. Water st., W. W. Wolcott, Prop. Refitted and refurnished.

STRIEBINGER HOUSE, between Ontario and Seneca sts. $2.00 per day. Hawley & Langton

CITY HOTEL, Seneca street. H. B. West, proprietor. $1.50 per day.

Hides, Pelts and Leather.

DENNISON BROS., dealers in Hides, Pelts, Furs and Tallow, 48 and 50 River street.

Hardwood Lumber.

MARTIN, J. T. dealer in Hardwood Lumber, Stone's Levee, near Central Way.

Lumber.

WOODS, PERRY & CO., manufacturers and dealers in Lumber, Lath, etc., 5 Carter st.

FISHER, WILSON & CO., wholesale lumber dealers (pine & hard wood), rough and dressed lumber, timber, lath shingles, etc. 47 Central Way

KRAUSE, C. A., & SON, wholesale and retail dealers in lumber. Yards cor. Superior and Wason and 281 Merwin streets.

Cleveland Business Directory.

Flue Cleaner.

CLEVELAND FLUE CLEANER M'F'G. CO. manufacturer of Aitchison & Doolittle's Patent Steam Flue Cleaner, 36 South Water Street.

Hardware and Iron.

BINGHAM, WM. & CO., Hardware, Iron, Nails and Metals, 148 and 150 Water street.

CLEVELAND ROLLING MILL CO., manuf'rs. of Steel and Iron Wire and Steel Tire.

WORTHINGTON, GEO. & CO., Hardware and Dealers in Metals, Water street.

Lime Manufacturers.

RUSSELL LIME CO., manufacturers of White Lime; also dealers in Plaster, Cement, etc. 85 Elm street.

Machinery and Boilers.

CLEVELAND STEAM FURNACE CO., Engines and Boilers, cor. Detroit and Center sts.

KRITCH, K. E. Metal Pattern Maker. Small machinery repaired. Lawn Mower sharpening a specialty. 42 South Water Street.

UNION MACHINE WORKS. Wason Street bet. St Clair and Superior Sts., manfrs and agents of G. W. Clayton's Elevators for passengers and freight. General machinists & jobbers.

PANKHURST, T. J. & CO., Valley Machine Works, manufacturers of Machinists' Tools, &c. Fine lathes a specialty. 6 Champlain street.

Machinery Depot.

CLEVELAND MACHINERY DEPOT. (now National Machinery Depot.) The largest stock of New and Second-hand Engines, Boilers and Machinists' Tools. Shop and Warehouse corner Bond and Superior streets.

Mercantile Agency.

THE MERCANTILE AGENCY. R. G. Dun & Co. proprietors. 121 Superior street.

Oil Manufacturers.

AMERICAN LUBRICATING OIL CO., manufacturers of lubricating oils, 23 Euclid ave.

Paints and Oils.

MASTERS, J. N. jobber in Paints, Oils, Varnishes, Brushes, 84 Prospect st.

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Business Directory.

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Business Directory.

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Business Directory.

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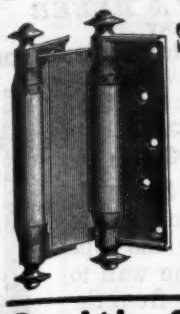

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Model Furnace for 1881,
All steel, light and durable, with Revolving Grate, etc. Also
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Guaranteed to feed coal, coke or charcoal without choking the draft.
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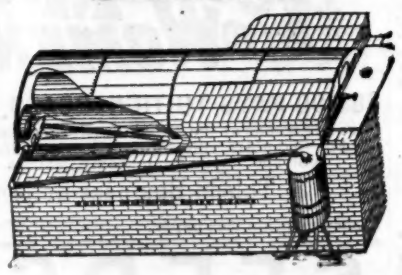

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Portable Mulay Saw Mill,

With improvements recently made is unequaled as a neighborhood mill. It can be run by either steam or water power, and is especially adapted to the engines used for threshing.

It may be operated by either two or three men, and will cut as much lumber in proportion to the power and number of hands employed as mills of larger capacity.

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Engines, Hoisting Machines
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EXTRA HEAVY STEAM ENGINES and other machinery adapted for Rolling Mills, Forges, Mines, &c., specially designed to suit local requirements.
Light and heavy Hoisting machinery of every description, adapted for either slow or rapid hoisting, and with or without Friction Clutches or Steam Boilers, &c. I am now prepared to manufacture my recently designed
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Specially designed for rapid hoisting, which for cheapness, simplicity, driving capacity, ease and reliability of operation will be found superior to any other hoisting machine in the market. Patterns changed or new patterns made in any case to suit local requirements,
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THIS IS OFFERED AS THE
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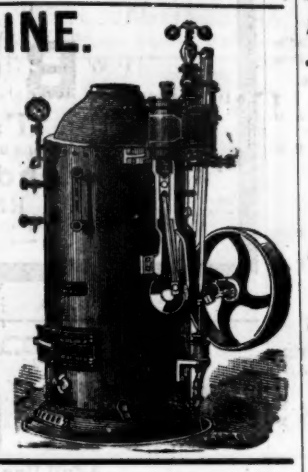

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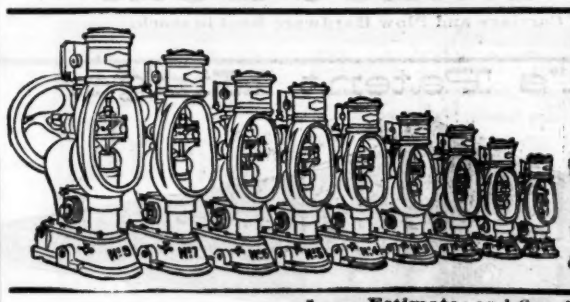

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NEW & SECOND-HAND
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Woodworking Machinery in all its Branches, Portable Engines, Upright and Horizontal Stationary Engines, 1 to 300 horse power, Locomotive Fire-box, Upright Boilers, 1 to 100 horse power, Waterwheels, Cotton and Woolen Machinery, Steam Pumps, Grist Mill Machinery, &c., &c., &c.
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EVERYWHERE to sell the best **Patented Saw Filer** made. *With* it an apprentice can file a Saw as well as the best expert *without*. They sell on their MERITS. Secure exclusive territory and BIG Profits.
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Manufacturers of the
Holland Lubricator,
for lubricating the Valves & Cylinders of Steam Engines.

Operating with downward visible drop. The principle of this Lubricant is entirely new; being the only one manufactured operating with a downward visible drop, and does not conflict with any other patented Lubricator, being protected with Letters Patent, granted July 5, 1881.
☞ A saving of from 50 to 90 per cent in cost of oils Send for Circular.

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THE TORRENT AND UNIQUE INDEPENDENT BOILER FEED
Steam Pumps,
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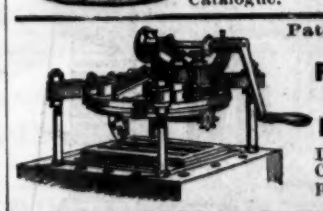
For Boilers of from 5 to 150 H.P., with Base, or Bracket on smaller sizes! Price $30 and upwards. Small sizes indispensable for Farm and traction engines. Also make a specialty of all kinds of castings. Send for new 1882 Catalogue.



Patent Portable Valve Seat
Rotary Planing Machine
Descriptive Circular on application.

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New Descriptive Circular on application.

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BOILER MAKER,
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BRIDGE STREET, SPRINGFIELD, OHIO
Special attention paid to taking out and Piecing Portable Flues.
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Castings done in White Metal, Brass, Zinc, Type Metal, Pig Lead, Pig Tin, Bar Lead, Bar Tin, Antimony, Copper, Spelter, &c., &c.
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Lake Shore & Michigan Southern.

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	Arrive.	Depart.
No. 20 Limited Express	1:35 A.M	*1.50 A.M
No. 6 Atlantic Express	*7:05	*7 30
No. 10 Buffalo Accom.	11:00	11 15
No. 8 C. & St. L. Exp.	*2:25 P.M	*2.55 P.M
No. 4 Special N. Y. Exp.	10:10	10 35
No. 2 San. Div. Accom.	10:12	
No. 12 Conneaut Accom.		4 50
Nottingham Accommodation (Sundays only)	10.05 A.M / 4.45 P.M	9.00 A.M / 2 15 P.M
No. 18 Elyria Accom.	8.50 A.M	

WEST BOUND TRAINS.

	Arrive.	Depart.
No. 18 Mich. Accom.		6.40 A.M
No. 1 Special Chicago Ex.	*8 35 A.M	7.00
No. 3 Toledo Express	1.25 P.M	3.30 P.M
No. 21 St. Louis Express	*1.40	*2.05
No. 5 Pacific Express	*7.05	*7.35
No. 11 Conneaut Accom.	8.40 A.M	
No. 19 Pt. Clinton Accom.		5.00
No. 7 Michigan Exp.	*2.50 A.M	*3.05 A.M
No. 17 N.Y. & Chi. Ex.	11.43 P.M	11.53 P.M

Cleveland, Columbus, Cincinnati & Indianapolis.

ARRIVALS.

No. 2 Col. & Cin. & Ind'polis Ex.	*7 10 A.M
No. 8 C. T.V. & W. & Clev Accom.	10 30
No. 12 St. Louis & New York Exp.	3 00 P.M
No. 4 Special Cin. & New York Exp.	3 20
No. 10 Wheeling & Cleveland Exp.	8 25
No. 6 Indianapolis & Columbus Exp.	10 20

DEPARTURES.

No. 1 Cincinnati & Columbus Exp.	8 00 A.M
No. 11 Cleve. Indianap. & Wheel'g Ex.	7 15
No. 3 St. Louis & Cincinnati Ex.	*2 00 P.M
No. 5 Night Express	*7 25
No. 7 C.T.V. & W. & Col. Accom.	4 00

Cleveland, Tuscarawas Valley & Wheeling.

ARRIVALS.

No. 4 Wheeling & Cleve'd Exp.	8 25 P.M
No. 2 Uhrichsville Accom.	10 30 A.M

DEPARTURES.

No. 1 Wheeling & Cleve'd Exp.	7 15 A.M
No. 3 Uhrichsville Accom.	4 00 P.M

New York, Pennsylvania & Ohio.

ARRIVALS.

No. 7 Mahoning Valley Accommo.	10 55 A.M
No. 3 New York Express,	*7 00 P.M
No. 1 New York Express,	*6 50 A.M
No. 3 Pittsburgh Express,	*7 00 P.M
No. 5 Pittsburgh Express,	3 10
New York Express	3 10
No. 9 Youngstown and Pitts. Local	10 15

DEPARTURES.

No. 12 New York Express,	*7 10 A.M
No. 4 Youngstown Local,	11 15
No. 8 Mahoning Accommodation,	4 25 P.M
No. 2 New York Express,	10 45
No. 12 Pittsburgh Express,	*7 10 A.M
No. 6 Pittsburgh & Main Line Express	2 30 P.M

Cleveland & Pittsburgh.

	DEPARTURES.	ARRIVE
Mail	8 50 A.M	1 15 P.M
Express	1 50 P.M	7 25
Alliance Accommodation	3 45	10 10 A.M
Ravenna Accommodation	5 30	8 35
Night Express	†11 40 P.M	6 30 A.M

† Night Express runs daily, except Saturday, by way of Wellsville, and on Saturday by way of Alliance.

Valley Railway.

ARRIVE.		DEPARTURES.	
No. 2 Accom.	10 15 A.M	No. 1 Mail	*8 20 A.M
No. 6 Express	1 35 P.M	No. 3 Accom.	4 05 P.M
No. 4 Mail	6 30 P.M	No. 5 Exp.	6 30

Trains leave from Depot foot of South Water Street.

Connotton Valley Railway.

Arrive.		Depart.	
No. 1	10 05 A.M	No. 4	4 00 P.M
No. 3	7 15 P.M	No. 2	8 50 A.M

All trains arrive and leave depot corner Commercial and Fifth Streets.

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WOOD ENGRAVER ON WOOD
No. 42½ SIXTH ST.
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THAT FAMOUS $5 STANDARD ELECTRIC BELT

gives strength to the Weak and Nervous, and will alone retain its reputation forever as the infallible conqueror of Pain and Disease. Circulars free.

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Standard Galvanic Co
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THE BRICK AND TILE MACHINES
BEST
J. W. PENFIELD
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NEW OTTO SILENT GAS ENGINE.

Working without Boiler, Steam, Coal, Ashes or Attendance.
Started instantly by a Match, it gives full power immediately.
When stopped all expense ceases.
No explosions; no fires nor cinders; no gauges; no pumps; no engineer or other attendant while running.

Unsurpassed in every respect for hoisting in warehouses, printing, ventilating, running small shops, &c., 2, 4 and 7 H.P. and upwards. Built by
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ESTABLISHED 1835.
Removed from 13 Water to Corner 23d and Smallman Streets,
PITTSBURGH, PA.
FIRST PREMIUM STEAM
BOILERS,
Stills, Tanks and Sheet Iron Work
of all descriptions made to order on short notice. Have on hand a large stock
New and Good Second Hand Boilers.
REPAIRING DONE PROMPTLY.
R. MUNROE.

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Manufacturers of
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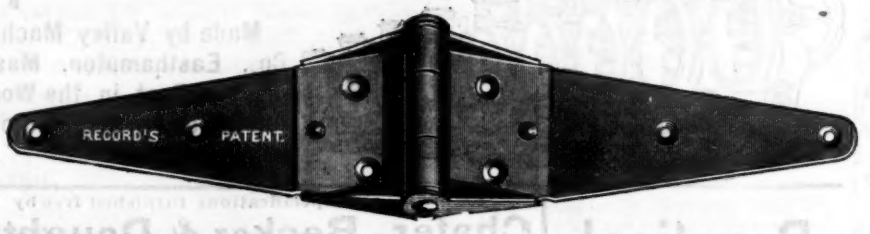
A full line of Carriage and Plow Hardware kept in stock.
Catalogues for the Trade.

Record's Patent Hinge.



THE MAIN PART of this Hinge is of the same style as the ordinary heavy strap. The joint is strengthened by FLANGED SUPPORTS, made of extra quality of iron, spanning the entire width of each leaf, firmly riveted to the back of the hinge. The pintle of the hinge passes through the ear of the flange, thus adding greatly to its strength. Also, by the additional thickness of iron, greatly STIFFENING THE HINGE where most liable to bend, and secure against breaking where the greatest part of the STRAIN COMES. As the straps of the hinge are bent down, forming an offset for the reception of the supports, the hinge is smooth or flat on the back, same as the ordinary hinge. These hinges are neat in appearance, and owing to their great strength admitting of smaller sizes being used than heretofore, renders them the most economical, as well as the most desirable hinges made. They are applied the same as ordinary hinges.

PRICES PER DOZEN PAIRS.
5-inch, $2.00. 6-inch, $2.80. 8-inch, $4.40. 10-inch, $6.60. 12-inch, $9.40.
Also manufacturers of
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MOSER & THOMPSON,
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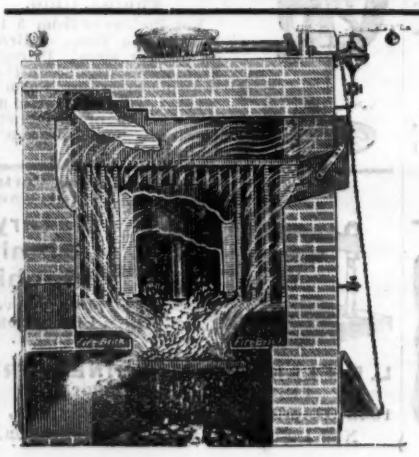

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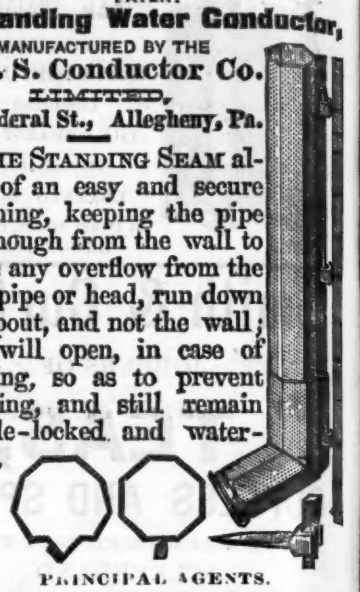
THE STANDING SEAM allows of an easy and secure fastening, keeping the pipe far enough from the wall to make any overflow from the eave pipe or head, run down the spout, and not the wall; and will open, in case of freezing, so as to prevent bursting, and still remain double-locked and water-tight.



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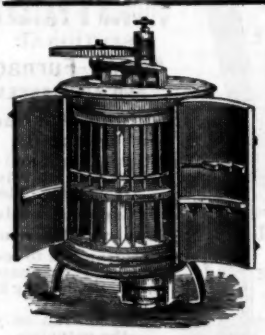

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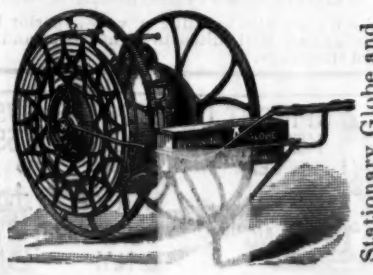

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VIA THE

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[Formerly Atlantic & Great Western Railroad.]

For New York, Boston and the East. The shortest and quickest route to Pittsburgh, Washington, Baltimore and the Southeast

Until further notice trains will leave the new Central Depot, South Water Street and Viaduct, as follows:

7:10A.M. LIGHTNING EXPRESS, (daily,) sleeping and hotel coaches from Leavittsburg 8:55 a.m. To New York, Albany and Boston without change. Parlor car, Cleveland to Salamanca. Arrives at Meadville 11:20 a.m., (dinner); Franklin, 12:33 p.m.; Oil City, 1:00 p.m.; Corry, 1:00 p.m.; Jamestown, (Lake Chatauqua) 1:57 p.m.; Buffalo, 6:15 p.m.; Rochester, 8:30 p.m.; Hornellsville, 6:40 p.m., (supper); Corning, 8:25 p.m.; Elmira, 8:57 p.m.; Binghampton, 10:38 p.m.; Albany, 6:00 a.m.; Boston, 2:45 p.m.; arriving at New York, 6:50 a.m.

10:45 P.M. NIGHT EXPRESS, (daily except Sunday), Sleeping Coach from Leavittsburg to New York without change. Arrives at Youngstown 1:45 a.m.; Meadville, 3:50 a.m.; Corry, 5:20 a.m.; Jamestown, 6:22 a.m.; Buffalo, 9:45 a.m.; Rochester, 1:10 p.m.; Hornellsville, 11:20 a.m.; Corning, 12:53 p.m.; Elmira, 1:21 p.m.; Binghampton, 2:50 p.m.; New York, 9:25 p.m.

2:30 P.M. PITTSBURGH EXPRESS,—daily, through without change. Parlor Car, Cleveland to Pittsburgh, arrives at Youngstown, 5:00 p.m.; Pittsburgh, 8:25 p.m; Washington, 7:30 a.m.; Baltimore, 8:15 a.m; via Sharon and Sharpsville to Meadville 7:40 p.m.

4:25 P.M. MAHONING ACCOMMODATION, stopping at all way stations. Arrives at Youngstown, 7:30 p.m; Sharon, 8:30 p.m; Sharpsville 8:40 p.m; connects at Leavittsburg with train No. 20 for Meadville and intermediate points, arrives at Meadville, 11:05 p.m.

7:10 A.M. PITTSBURGH EXPRESS,—(daily) through without change. Arrives at Youngstown, 10:00 a.m.; Sharon, 10:55 a.m.; Sharpsville, 11:05 a.m.; Pittsburgh, 1:08 p.m. Returning, leave Pittsburgh, 4:48 a.m., 8:55 a.m., and 1:15 p.m. and 4:20 p.m.

11:15 A.M. YOUNGSTOWN & PITTSBURGH Accommodation, stopping at all Way Stations, arriving at Youngstown 2:10 p.m.; Pittsburgh, 6:10 p.m. Trains arrive at Cleveland, 6:50 a.m., 10:55 a.m. 3:10, p.m. 7:00 p.m., and 10:15 p.m.

☞ This is the only route by which passengers can reach Corry, Elmira, Binghampton, New York City, and intermediate points WITHOUT CHANGE. No change to Boston and New England cities.

Baggage Checked Through to All Points East

☞ Through Tickets and information regarding the route can be obtained at the Union Ticket Office, corner Bank and Superior streets; at office 131 Bank street, and at new Depot of New York, Pennsylvania and Ohio Railway, South Water street and Viaduct, Cleveland.

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Gen. Pass'r. Agt., Cleveland, Ohio.

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all sizes and kinds, with and without Axles.

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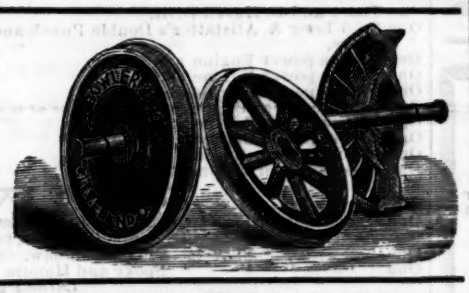

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Agents for A. S. Cameron's Pumps.

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The strongest, safest and most economical explosive
KNOWN TO THE ARTS.

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C. L. JEFFORDS,

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Axes and Edge Tools.

JAMESTOWN, N. Y.

Send for prices to the Trade.

CLEVELAND & PITTSBURGH

RAILROAD.

Trains leave and arrive daily, (Sunday excepted,) at the points named below, as follows:

MAIN LINE—GOING WEST.

	Western Expr'ss.	Mail Expr'ss.	Fast Line.	Accom.
Leave				
Pittsburgh	7 30 a m.	2 00 pm	11 50 pm	.....
Allegheny	7 40	2 10	12 00 am	.....
Arrive				
Rochester	8 23	3 00	12 50	.....
Beaver	8 30	3 05	12 55	.....
E. Liverpool	9 08	3 37	1 37	.....
Wellsville	9 18	3 47	1 50	.....
Salineville	9 57	4 24	2 33	.....
Bayard	10 34	5 02	3 21	.....
Alliance	11 05	5 35	3 55 am	.....
Leave				
Alliance	11 10	5 25	4 05	7 30 am
Arrive				
Ravenna	11 48	5 59	4 47	8 15
Hudson	12 18 p.m.	6 23	5 15	8 50
Cleveland	1 15 p.m.	7 35 pm	6 30 am	10 10 am

Accommodation train leaves Ravenna at 6.45 a. m., arrives Hudson 7.15 a.m., Cleveland 8.35 a.m.

☞ Mail Express runs through Parlor Car, Fast Line and Western Express through Sleeping Car Pittsburgh to Cleveland.

NOTE —Fast Line leaves Pittsburgh Sunday nights, but not on Saturday nights.

MAIN LINE—GOING EAST

	Pittsb'g Expr'ss.	Fast Line.	Day Expr'ss.	Accom.
Leave				
Cleveland	8 00 am	1 50 pm	11 40 pm	3 45 pm
Arrive				
Hudson	9 05	2 50	12 50 am	4 55
Ravenna	9 37	3 17	1 18	5 30
Alliance	10 20	3 53	2 05	6 20 pm
Bayard	10 54	4 16	2 49	.....
Salineville	11 40	4 51	3 40	.....
Wellsville	12 20 pm	5 20	4 35	.....
E. Liverpool	12 54	5 44	4 57	.....
Beaver	1 30	6 17	5 47	.....
Rochester	1 35	6 22	5 52	.....
Allegheny	2 30	7 05	6 45 am	.....
Pittsburgh	2 40	7 15	6 55	.....
Harrisburg	.....	3 50 am	4 00 pm	.....
Baltimore	.....	7 30	7 20	.....
Washington	.....	9 02	8 47	.....
Philadelphia	.....	7 20	7 35	.....
New York	.....	10 25	10 35	.....
Boston	.....	8 00 pm	.....	.....

Accommodation train leaves Cleveland Union Depot at 5.30 p.m., arrives Hudson 6.50 p.m., Ravenna 7 20 p m.

All trains connect at Yellow Creek for Wheeling and Bellaire.

☞ Pittsburgh Express runs a Parlor Car Cleveland to Pittsburgh. Fast line runs Through Sleeper to New York. Day Express runs Through Sleeper to Pittsburgh.

TUSCARAWAS BRANCH.

Trains leave Bayard at 11.00 a.m. and 5.10 p.m. arrive Minerva 11 08 p.m and 5 20 p.m : arrive Dover 12.18 p.m. and 7.15 p.m., New Philadelphia 12.30 p.m. and 7.30 p m. Returning leave New Philadelphia at 7.00 a. m. and 2.05 p. m., Dover at 7.30 a.m. and 2.15 p m., Minerva at 9 45 a.m. and 3.23 p m., Bayard at 10.00 a.m and 3.33 p.m.

All trains daily except Sunday.

D. W. CALDWELL, General Manager, Pittsburgh, Pa. — E. A. FORD, Gen'l Pass. & Tkt. Agt.

E. E. GARVIN & CO.

Manufacturers of

Milling Machines, Drill Presses
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Cornell's Building, NEW YORK.

☞ Send for Illustrated Catalogue.

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GIVE HATCH SIZE & ELEVATION OF BUILDING, & SEND FOR ILLUSTRATED CIRCULAR
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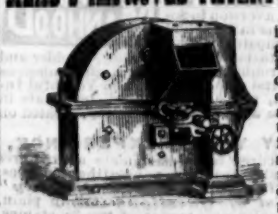

For disintegrating, granulating or grinding without friction all kinds of material. It requires less power and grinds faster than any machine in the market. Is strong and simple; not liable to get out of order; no annoyance to workman from dust, and is the best machine in the market for grinding sugar, glue, sumac or drugs. Descriptive pamphlets will be sent free on application to MEAD & CO., 32 Atwater street, DETROIT, MICH.

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E. C. PECKHAM,
Manufacturer of all kinds of
CAST STEEL SAWS.
Repairing promptly attended to. Thin Planer Knives a specialty. Also manufacturer and jobber of FILES. Old Files Re-Cut. 6 St. Clair street, TOLEDO, O.

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Gentlemen's Clothes Cleaned, Dyed and Repaired a Specialty.
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LOST MANHOOD
Seminal Weakness, Pimples and Impure Blood, loss of Energy and Strength, aversion to Society, Pains in Back and Loins, Impaired Memory, Palpitation, loss of Vitality, Bladder and Urinary troubles, distressing Night Emissions and the vital drain arising from Youthful Indiscretion, which, if neglected, terminate in Impotence and Premature Decay, treated on results of
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Cor. Bond & Rockwell Streets, Cleveland, O.
SALESROOM—384 SUPERIOR STREET, CORNER BOND.
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STOCK KEPT OF IRON AND WOOD WORKING MACHINERY,
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In Stock for Sale:
One Thorn and DeHaven Drill.
One No. 7 Long & Allstatter's Double Punch and Shears.
One 4-horse power Engine and Boiler.
One 6-horse power Engine and Boiler
One 7-horse power Engine and Boiler.
One 10-horse power Engine and Boiler.
One 5-horse power Engine.
One 8-horse power Engine.
One 12-horse power Engine.
One 25-horse power Engine. New.
One 30-horse power Engine. New.
One portable Engine and Boiler 7½x10, mounted on wheels. All in complete order. Used only about three years.
One 30-inch under run French burr mill. All complete. Send for description and price.
One 35-horse power Engine. And several others all in stock.
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List of Wood Tools.
One second-hand Frank two-spindle Shaper, $65.
One " " wood frame 2-spindle Shaper, $85
One " " " " Cutting-off Saw, $30
One " " " " Spoke and Handle Lathe $125
One " " 22 inch Greenwood Heading Planer, $125
One " " Ellis Blind Slat Tenoner.
One " " 24-inch Ball & Co., Planer and Matcher.
One " " Power Rod and Dowell machine
One " " Fay & Co. No. 1 Railway Cut-off Saw.
Two " " Sandpaper Drums.
One second-hand Dimension Planer, 24-inches, with Feed attachment.
One " " wood frame swing Cut-off Saw and Table.
One " " Slotting machine.
One " " Thorn & Dehaven Drill.
Two " " Saw Tables.
One wood frame 6 inch sticker.
Large lot second-hand Trenton Vises.
Large lot second-hand Anvils.
One Fay & Co. Agricultural Morticer, with boring attachment.
One Fay & Co. iron frame Tenoning machine, double heads.

Having moved our Salesroom to the large room previously occupied by the Wilson Sewing Machine Company, we are able to carry a very fine line of Wood Working Machinery and other Tools.

Glazed Windows.
CLEVELAND WINDOW GLASS CO.
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Manufacturers of
Power and Foot Presses,

Dies and Tools
FOR WORKING
Sheet Metal and Wire.

FRUIT CAN
And Tinners' Tools, &c.
Nos. 147 and 149 Elm Street,
BUFFALO, N. Y.

Cleveland, Akron and Columbus RAILROAD.
Trains leave and arrive daily (Sundays excepted) at the points named below.

GOING SOUTH.

STATIONS. February 20, '82.	Miles	Mail and Expr 2	Thro' Pass'gr 4	Accom 6	Accom 8
		A.M.	P.M.	P M.	
Cleveland		8.00	1.50	3.45	.....
Hudson (1)	0	9.15	3.00	5.05	.....
Cuyahoga Falls	8	9.32	3.18	5.23	.....
Akron (2)	14	9.47	3.33	5.36 / 5.50	.....
Clinton	27	10.17	4 04	6.23	.....
Warwick	28	10 23	4.10	6 31	.....
Marshallville	35	10 35	4.23	6.45	.....
Orrville (4)	39	10.51	4.43	7.03	.....
Fredricksburg	52	11.22	5.16	7.37	.....
Holmesville	56	11.34	5 28	7.52	A. M.
Millersburg	62	11 48	5.41	8.05	5.40
		P.M.			
Killbuck	68	12.02	5 55	.....	5.54
Black Creek	74	12.16	6.09	.....	6.08
Gann	82	12.41	6.35	.....	6.33 / 6.53
Danville	88	12 55	6.49	.....	7.07
Howard	91	1.05	6.59	.....	7.18
Gambier	95	1.15	7.11	.....	7.29
Mt. Vernon (5)	100	1.30	7.27	.....	7.43
Mt. Liberty	109	1.58	7.47	.....	7 59
Centerburg (6)	114	2.08	7.57	.....	8.19
Condit	120	2 22	8.11	.....	8.24
Sunbury	124	2.31	8 20	.....	8.35
Galena	126	2.36	8 26	.....	8.41
Westerville	133	2.51	8 42	.....	8.58
Columbus (7)	145	3.15	9.06	.....	9 23

GOING NORTH.

STATIONS. February 20, '82.		Thro' Pass'gr 1	Mail Expr 3	Accom 5	Accom 7
		A M.	P M		P M.
Columbus	0	6.00	12.15	.....	5.05
Westerville	12	6 25	12 41	.....	5 32
Galena	19	6.41	12.57	.....	5.49
Sunbury	21	6.47	1.03	.....	5.55
Condit	25	6.56	1 13	.....	6 06
Centerburg	31	7.10	1 27	.....	6.20
Mt. Liberty	36	7.20	1 38	.....	6.32
Mt. Vernon	45	7.43	2.02	.....	6.59
Gambier	50	7.55	2.15	.....	7.11
Howard	54	8.05	2.25	.....	7 23
Danville	59	8.15	2.36	.....	7.34
Gann	68	8.30	2 50	.....	7 49
Black Creek	71	8 56	3 15	.....	8.15
Killbuck	77	9.10	3.28	.....	8.29
				A M	
Millersburg	8	9 26	3.43	5 50	8 42
Holmesville	89	9 37	3 55	6.05	.....
Fredricksburg	93	9 49	4 06	6.18	.....
Orrville	06	10 23	4.43	6.40 / 7.10	.....
Marshallville	12	0 35	4 55	7.23	.....
Warwick	117	10.48	5 09	7.37	.....
Clinton	118	10 52	5.15	7.46	.....
Akron	31	11 28	5 47	8 22	.....
Cuyahoga Falls	137	11.41	6 00	8.35	.....
Hudson	145	12 00 M	6.18	8 55	.....
Cleveland		1 15 P M	7 25	10 10	

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